MASON COUNTY PUD NO. 1

MASON COUNTY WASHINGTON



CONTRACT PROVISIONS

for

MANZANITA RESERVOIR AND BOOSTER PUMP STATION

G&O #22260 MAY 2025



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PUBLIC NOTICE

INVITATION FOR BIDS Manzanita Reservoir and Booster Station

ENGINEER'S ESTIMATE \$3,505,000

NOTICE IS HEREBY GIVEN THAT PUBLIC UTILITY DISTRICT No. 1 OF MASON COUNTY, WA, does hereby invite bids from qualified, responsible bidders for Manzanita Reservoir and Booster Station.

SUBMISSION DEADLINE:

SEALED proposals must be received at the Mason County PUD No. 1 main office located at 21971 North Highway 101, Shelton, WA 98584, by Monday, June 09, 2025 at 3:30 PM, be addressed to "Brandy Milroy-Manzanita Reservoir and Booster Station" and include amounts for furnishing the necessary labor, materials, equipment, and tools, thereof to construct the Manzanita Reservoir, Booster Station, and Generator. Contractors may submit the bid in person at the PUD office between 8:00 a.m. to 4:30 p.m. Monday through Friday or by mail to the PUD office. The PUD makes no guarantee that bid packages submitted by mail will arrive prior to the bid deadline. Bidding documents for the project are prepared by Gray & Osborne and are available on the PUD's website: https://mason-pud1.org/bids/. All bid information, including addenda will be available on this site. All addendum(s) must be signed and acknowledged and included as part of the bid packet.

BID OPENING:

A public bid opening will be held on Monday, June 09, 2025, at 4:00 PM PST via Zoom.

Zoom Link Info: https://us02web.zoom.us/j/88188823865

Proposals are to be submitted only on the form provided with the Bid Documents. All Proposals must be accompanied by a certified check, postal money order, cashier's check, or Proposal bond payable to the "Mason County PUD No. 1" and in an amount of not less than five percent (5%) of the total Proposal amount.

DISTRICT OPTION TO REJECT ALL BID PROPOSALS:

The District may, at its sole discretion, reject any or all bid proposals submitted. The District shall not be liable for any costs incurred in connection with the preparation and submittal of any bid proposal. The District reserves the right to waive any informality in a submitted proposal.

SCOPE OF WORK:

The project includes the construction of two (2) new 200,000-gallon reinforced concrete reservoir with booster pump station building, booster pump station, standby generator, piping, site improvements, stormwater pond, security fencing, temporary erosion and sedimentation control, demolition of Highland Park existing reservoir and booster station, and restoration.

The Work shall be substantially complete within 150 working days after the commencement date stated in the Notice to Proceed. All bidding and construction are to be performed in compliance with the

Contract Provisions and Contract Plans for this project and any addenda issued thereto that are listed on the PUD's website: https://mason-pud1.org/bids/

For questions concerning bid documents, submittal requirements, or technical questions contact Shari Gaer, E.I.T., Project Manager at (360)292-7481 or sgaer@g-o.com and when emailing CC Brandy Milroy Water Resource Manager at brandym@mason-pud1.org.

PREPARATION AND CONTENT OF THE PROPOSAL:

Contractor must acknowledge receipt of any addenda (if applicable). Contractor is required to bid entirety of the Proposal. Contractors and Subcontractors must be registered and active on Sam.gov to bid on this project.

PRE-BID JOB SHOW:

A **mandatory** pre-bid job show is scheduled for Tuesday, May 20, 2025, at 10:00 AM PST. The job show will begin at the project site at 1681 E McReavy Rd, Union, WA 98592 promptly at 10:00 AM PST. Prospective bidders are required to participate. Comments and questions for the project will close on Tuesday, May 27, 2025, by 4:00 PM PST.

COMPLIANCE WITH STATE & FEDERAL GRANTOR REGULATIONS:

This project is funded through the Washington State Public Works Board Loan program. PWB requirements and provisions must be met by general contractors and all subcontractors. All contractors and subcontractors must be licensed in the state of Washington to conduct business.

PREVAILING WAGE:

All contractors and subcontractors are required to pay Washington State prevailing wage in accordance with all applicable RCW's and Washington State laws. Contractor shall comply with all requirements concerning public works, without limitation, prevailing wage. View prevailing wage rates at https://lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates/ using the published updated wage rates as of June 17, 2025, or view a copy at Mason County PUD No. 1's offices at 21971 N. Hwy. 101, Shelton, WA 98584. If requested, a copy will be mailed.

"This project is subject to the 15% Apprentice Utilization Requirement (ARU), as per RCW 39.04.320 - see section 4 of the Specs for additional information".

DISADVANTAGED BUSINESS ENTERPRISE:

Mason County PUD No. 1 is an equal opportunity employer; small, minority and women owned firms are strongly encouraged to apply.

Brandy Milroy, Water Resource Manager

CONTRACT PROVISIONS

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PART 1 BID DOCUMENTS

BIDDER'S CHECKLIST

1. REQUIRED FORMS

The Bidder shall submit the following forms, which must be executed in full and submitted with the Proposal.

a. Proposal (including Statement of Bidder's Qualifications) (Pages P-1 - P-9)

(PB-1)

b. Bid Deposit or Proposal Bond

2. SUPPLEMENTAL BIDDER CRITERIA

The Apparent two lowest bidders shall submit to the Contracting Agency the completed Supplemental Bidder Criteria forms in the Appendix by noon of the second business day following the bid submittal deadline.

3. AGREEMENT FORMS

The following forms (a., b., and c.) are to be executed and the Certificates of Insurance (d. and e.) are to be provided after the Contract is awarded and prior to Contract execution.

- a. Agreement (Pages A-1 A-3)
- b. Performance Bond (Page B-1)
- c. Public Works Payment Bond (Page B-2)
- d. Certificate of Insurance
- e. Certificate of Builders Risk Insurance

MANZANITA RESERVOIR AND BOOSTER PUMP STATION

PROPOSAL

Mason County PUD No. 1 21971 North Highway 101 Shelton, Washington 98584

The undersigned has examined the Work site(s), local conditions, the Contract, and all applicable laws and regulations covering the Work. The following unit and lump sum prices are tendered as an offer to perform the Work in accordance with all of the requirements set forth in the Contract and all applicable laws and regulations.

As required by the Contract, a postal money order, certified check, cashier's check or Proposal bond made payable to the Owner is attached hereto. If this Proposal is accepted and the undersigned fail(s) or refuse(s) to enter into a contract and furnish the required performance bond, labor and material payment bond, special guarantee bonds (if required), required insurance and all other required documentation, the undersigned will forfeit to the Owner an amount equal to five percent of the Proposal amount.

After the date and hour set for submitting the Proposals, no bidder may withdraw its Proposal, unless the Award of the contract is delayed for a period exceeding 60 consecutive calendar days.

The undersigned agrees that in the event it is Awarded the contract for the Work, it shall employ only Contractors and Subcontractors that are duly licensed by the State of Washington and remain so at all times they are in any way involved with the Work.

The undersigned agrees that the Owner reserves the right to reject any or all Proposals and to waive any minor irregularities and informalities in any Proposal.

The undersigned agrees that the Owner will Award the Contract to the lowest responsible, responsive bidder whose Proposal is in the best interest of the Owner.

SCHEDULE A: MANZANITA RESERVOIR AND BOOSTER PUMP STATION

<u>NO</u> .	<u>ITEM</u>	QUA	<u>NTITY</u>	UNIT PRICE	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1	LS	\$	\$
2.	Minor Change	1	CALC	\$20,000.00	\$20,000.00
3.	Demolition	1	LS	\$	\$
4.	Decommission Septic Tank and Drainfield	1	LS	\$	\$
5.	Project Temporary Traffic Control	1	LS	\$	\$
6.	Locate Existing Utilities	1	LS	\$	\$
7.	Clearing and Grubbing	1	LS	\$	\$
8.	Trench Excavation Safety Systems	1	LS	\$	\$
9.	Erosion Control	1	LS	\$	\$
10.	Unsuitable Excavation	20	CY	\$	\$
11.	Sitework	1	LS	\$	\$
12.	Gravel Borrow	1,000	TN	\$	\$
13.	Crushed Surfacing Top Course	130	TN	\$	\$
14.	Crushed Surfacing Base Course	260	TN	\$	\$
15.	Restoration	1	LS	\$	\$
16.	200,000 Gallon Concrete Reservoir and Foundation	2	EA	\$	\$
17.	Booster Station Building	1	LS	\$	\$
18.	Packaged Pump Station	1	LS	\$	\$
19.	Piping, Valves, and Appurtenances	1	LS	\$	\$

<u>NO</u> .	<u>ITEM</u>	<u>QUANTITY</u>	UNIT PRICE	<u>AMOUNT</u>
20.	Emergency Propane Generator and Propane Tank	1 LS	\$	\$
21.	Telephone Service	1 LS	\$	\$
22.	Electrical, Telemetry, and Instrumentation	1 LS	\$	\$
23.	Apprenticeship Incentive	1 CALC	\$2,000.00	\$2,000.00
24.	Apprenticeship Penalty	1 CALC	\$0.00	\$0.00
Subto	tal (Schedule A):		\$	
Wash	ington State Sales Tax (8.6%):		\$	
TOTA	AL CONSTRUCTION COST (SCHE	DULE A):	\$	

SCHEDULE B: MANZANITA TO ALDERBROOK WATER MAIN

<u>NO</u> .	<u>ITEM</u>	QUAN	<u>NTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1.	Mobilization and Demobilization	1	LS	\$	\$
2.	Minor Change	1	CALC	\$10,000.00	\$10,000.00
3.	Project Temporary Traffic Control	1	LS	\$	\$
4.	Locate Existing Utilities	1	LS	\$	\$
5.	Trench Excavation Safety Systems	1	LS	\$	\$
6.	Removal of Unsuitable Material (Trench)	20	CY	\$	\$
7.	Erosion Control	1	LS	\$	\$
8.	8-Inch C900 PVC Water Main (Incl. Bedding)	2,795	LF	\$	\$
9.	Additional Fittings	1,000	LB	\$	\$
10.	8-Inch Gate Valves	3	EA	\$	\$
11.	Foundation Gravel	95	CY	\$	\$
12.	Gravel Borrow for Trench Backfill	1,025	TN	\$	\$
13.	Crushed Surfacing Top Course	165	TN	\$	\$
14.	Road Repair	1	LS	\$	\$
15.	Quarry Spalls	155	CY	\$	\$
16.	Controlled Density Fill	5	CY	\$	\$
Subto	etal (Schedule B):	•••••		\$	
Wash	ington State Sales Tax (8.6%):			\$	
TOTA	AL CONSTRUCTION COST (SCHE	DULE I	3):	\$	

BID SUMMARY

1.	TOTAL CONSTRUCTION COST (SCHEDULE A forwarded from page P-3):\$
2.	TOTAL CONSTRUCTION COST (SCHEDULE B forwarded from page above):\$
3.	TOTAL CONSTRUCTION COST (SCHEDULES A AND B):\$

Note: A bid must be received on all items.

STATEMENT OF BIDDER'S QUALIFICATIONS

Name of Firm:	
Address:	
Telephone No.	Fax No.
Contact Dougon for this Duciect.	
E-mail:	
Number of years the Contractor has beefirm name, as indicated above:	en engaged in the construction business under the present
WORK TO E	BE COMPLETED BY BIDDER
List the Work and the dollar amount awarded the contract.	thereof that the Bidder will complete with its forces, if
Work to be Performed	Dollar Amount

PROPOSED SUBCONTRACTORS (Per RCW 39.30.060)

In accordance with RCW 39.30.060, for Proposals exceeding one million dollars, failure to list subcontractors with whom the bidder, if awarded the contract, will directly subcontract for performance of the work of structural steel installation, rebar installation, heating, ventilation and air conditioning, plumbing, as described in Chapter 18.106 RCW, and electrical, as described in Chapter 19.28 RCW or naming more than one subcontractor to perform the same work will result in your bid being non-responsive and therefore void.

These subcontractors must be listed below along with the work to be performed. This information must be provided with the Proposal or within one hour after the published bid submittal time for the work of heating, ventilation, air conditioning, plumbing and electrical. This information must be provided with the Proposal or within 48 hours after the published bid submittal time for the work of structural steel and rebar installation.

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

Subcontractor Name			
Work to be performed			
Subcontractor Name			
Work to be performed			
Subcontractor Name			
Work to be performed			
Subcontractor Name			
Work to be performed			
Subcontractor Name			
Work to be performed			

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

ADDENDA RECEIVED

Addendum No.	Date Received	Name of Recipient

NOTE: Bidder shall acknowledge receipt of all addenda. Bidder is responsible for verifying the actual number of addenda issued prior to submitting a Proposal.

Subject to any extensions of the Contract Time granted under the Contract, the undersigned agrees to substantially complete the Work required under this Contract within 150 working days (the Substantial Completion Date) and to physically complete the Work required under this contract within 160 working days (the Physical Completion Date) from when Contract Time begins.

The undersigned has reviewed and fully understands the provisions in the Contract regarding liquidated damages and agrees that liquidated damages shall be \$1,500.00 per day for each and every working day beyond the Contract Time allowed for substantial completion until the Substantial Completion Date is achieved and \$750.00 for each and every working day required beyond the Contract Time for physical completion until the Physical Completion Date is achieved.

The undersigned is, and will remain in, full compliance with all Washington State administrative agency requirements including, but not limited to registration requirements of Washington State Department of Labor & Industries for contractors, including but not limited to requirements for bond, proof of insurance and annual registration fee. The undersigned's Washington State:

Dept. of Labor and Industries Workman's Compensation Account No. is			;
Dept. of Licensing Contractor's Registration No. is		;	
Unified Business Identifier Number is	;		
Excise Tax Registration Number is	_; and		
Employment Security Account Number is	•		

The undersigned has reviewed all insurance requirements contained in the Contract and has verified the availability of and the undersigned's eligibility for all required insurance. The undersigned verifies that the cost for all required insurance, has been included in this Proposal.

In relation to claims related in whole or in part to workplace injuries to employees, the undersigned waives any immunity granted under the State Industrial Insurance Law, RCW Title 51. This waiver has been specially negotiated by the parties, which is acknowledged by the undersigned in signing this Proposal.

By signing the proposal, the undersigned declares, under penalty of perjury under the laws of the United States and the State of Washington, that the following statements are true and correct:

- 1. That the undersigned person(s) or entity(ies) has(have) not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the project for which this Proposal is submitted.
- 2. The bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date (**INSERT DATE**), that 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.

The undersigned agrees that the Owner is authorized to obtain information from all references included herein.

Sincerely,	
Sign Name	Date
By:	
By: Print Name, Title	Location Executed (City, State or County)
Print Company Name	
Amount of Proposal deposit: \$	Check No.
or Proposal bond in the amount of\$	
, issued through	
	Name of Bank/Bonding Company
located at	
	Mailing Address
T.11	
Telephone Number of Bank/Bonding Com	ipany

PROPOSAL BOND

KNOW ALL MEN	BY THESE PRESENTS, That we	
of	as principal, and the	
a corporation duly organiz	ed under the laws of the state ofand authorized to do busin	
Washington, as surety, are the full and penal sum of f the work hereinafter descr	and authorized to do busing the held and firmly bound unto the MASON COUNTIVE percent of the total amount of the bid proposal libed, for the payment of which, well and truly to be ators and assigns, and successors and assigns, firm	NTY PUD NO. 1 in of said principal for e made, we bind our
	this bond is such, that whereas the principal proposal for the following construction project, to	
MANZANI	TA RESERVOIR AND BOOSTER PUMP STA	TION
said bid and proposal, by r	reference thereto, being made a part hereof.	
contract be awarded to sa execute said Contract and within a period of 10 days	RE, If the said proposal bid by said principal bid principal, and if said principal shall duly make shall furnish bond as required by the MASON CO is from and after said award, exclusive of the day I and void, otherwise it shall remain and be in full	e and enter into and DUNTY PUD NO. 1 of such award, then
IN TESTIMONY	WHEREOF, The principal and surety have caused	these presents to be
signed and sealed this	day of	,
	(Principal)	
	(Surety)	
	(Attorney-in-fact)	

PART 2 AGREEMENT AND BONDS

AGREEMENT

THIS AGREEMENT is entered into by and between the MASON COUNTY PUD NO. 1 (hereinafter called the Owner) and
(hereinafter called the Contractor).
The Owner and the Contractor agree as follows:
ARTICLE 1. WORK.
[Include description of all schedules, alternate or additive items awarded]
ARTICLE 2. CONTRACT TIME.
The Contractor shall substantially complete the Work required by the Contract within
working days (the Substantial Completion Date) and physically complete the
Work withinworking days (the Physical Completion Date)
ARTICLE 3. LIQUIDATED DAMAGES.
The Owner and the Contractor was in 144 to 15 february and that the Owner
The Owner and the Contractor recognize that time is of the essence and that the Owner will suffer financial loss if the Work is not completed within the time, plus any
extensions thereof, allowed in accordance with the Contract. They also recognize the
inconvenience, expense, and difficulties involved in a legal proceeding to prove the
actual loss suffered by the Owner if the Work is not completed within the time allowed in
the Contract. Accordingly, the Owner and the Contractor agree that as liquidated
damages for delay, and not as a penalty, the Contractor shall pay the Owner
(\$) per day for each working day beyond the Substantial Completion
Date until the Contractor schieves substantial completion of the Work and
(\$ per day for each working day beyond the Physical Completion Date
until the Contractor achieves physical completion of the Work.
APTICLE & CONTRACT PRICE

The Owner shall pay the Contractor the amount(s) set forth in the Proposal (in United States dollars) for completion of the Work in accordance with the Contract.

ARTICLE 5. CONTRACT.

The Contract, which comprises the entire agreement between the Owner and the Contractor concerning the Work, consists of the following:

- This Agreement;
- The Contractor's Proposal including the bid, bid schedule(s), information required of bidder, Proposal bond, and all required certificates and affidavits;
- The Performance Bond and the Public Works Payment Bond
- The Contract Provisions;
- The Plans (or drawings) consisting of index on sheet _____ of the Plans;
- Addenda numbers ______, inclusive; and
- Change Orders issued after the effective date of this Agreement.

There are no Contract Documents other than those listed in this Article 5. The Contract may be amended only in writing by Change Order as provided in the Contract.

ARTICLE 6. MISCELLANE QUS.

For purpose of indemnifying and defending any work place injury claims by employees of the Contractor and Subcontractors, the Contractor waives any immunity granted under the State Industrial Insurance Law, RCW Title 51. This waiver has been specifically negotiated between the parties and is hereby acknowledged by the Contractor. (Contractor's initials)

The Contractor shall not assign any rights under or interests in the Contract, including but not limited to rights to payment, without the prior written consent of the Owner. Unless specifically stated in a written consent to an assignment, no assignment will release or discharge the Contractor-assignor from any duty or responsibility under the Contract.

The Contract is binding upon the Owner and the Contractor, and their respective partners, successors, assigns and legal representatives.

IN WITNESS WHEREOF, Owner and Contractor have caused this Agreement to be executed the day and year indicated below.

MASON COUNTY PUD NO. 1	CONTRACTOR
	License No.
By	By
Date	Title
	Attest
	Name and Address for siving notices (print)
	7

PUBLIC WORKS PERFORMANCE BOND to MASON COUNTY PUD NO. 1, WA

Bond No. _____

	n, (County) has awarded to et designated as Manzanita Reservoir and Booster Pump Station I is required under the terms of that Contract to furnish a bond
State of and licensed to do be current list of "Surety Companies Acceptable in Fede Staff Bureau of Accounts, U.S. Treasury Dept., are jo sum of	(Surety), a corporation organized under the laws of the usiness in the State of Washington as surety and named in the eral Bonds" as published in the Federal Register by the Audit intly and severally held and firmly bound to the County, in the US Dollars (\$ amount to
include sales tax) Total Contract Amount, subject to the This statutory performance bond shall become null administrators, successors, or assigns shall well and	the provisions herein. I and void, if and when the Principal its heirs, executors, faithfully perform all of the Principal's obligations under the
Contract and fulfill all the terms and conditions of all	duly authorized modifications, additions, and changes to said and in the manner therein specified, and if such performance
The Surety agrees to indemnify, defend, and protect to from the failure of the Principal, its heirs, executors, a subcontractors, or lower tier subcontractors of the Principal.	the County against any caim of direct or indirect loss resulting administrators, successors, or assigns (or any of the employees, acipal) to faithfully perform the Contract.
Contract, the specifications accompanying the Contra any way affect its obligation on this bond, and waters to the terms of the Contract or the work performed. Th	extension of time, alteration or addition to the terms of the ct, or to the work to be performed under the Contract shall in notice of my change, extension of time, alteration or addition e Surety agrees that modifications and changes to the terms and ount to be paid the Principal shall automatically increase the sty is not required for such increased obligation.
This bond may be executed in two (2) original counterp. This bond will only be accepted if it is accompanied be executing on behalf of the surety.	parts, and shall be signed by the parties' duly authorized officers. y a fully executed and original power of attorney for the officer
The Surety agrees to be bound by the laws of the state Washington.	e of Washington and subjected to the jurisdiction of the state of
PRINCIPAL	SURETY
Principal Signature Date	Surety Signature Date
Printed Name	Printed Name
Title	Title
Local office/agent of Surety Company:	
Name	Telephone
Address	



PUBLIC WORKS PAYMENT BOND to MASON COUNTY PUD NO. 1, WA

Bond No. _____

The MASON COUNTY PUD NO. 1, Washing	ton, (County) has awarded to
	ject designated as Manzanita Reservoir and Booster Pump Station
	al is required under the terms of that Contract to furnish a payment
bond in accord with Title 39.08 Revised Code of W	ashington (RCW) and (where applicable) 60.28 RCW.
The Principal, and	(Surety), a corporation organized under the laws of the
	business in the State of Washington as surety and mamed in the
	ederal Bonds" as published in the Federal Register by the Audit
• • • • •	jointly and severally held and firmly bound to the County, in the
	US Dollars (\$ amount to
include sales tax) Total Contract Amount, subject t	
This statutory payment hand shall become null and y	roid, if and when the Principal, its heirs, executors, administrators,
successors or assigns shall nav all persons in according	ordance with RCW Titles 60.28, 39.88, and 39.12 including all
	tier subcontractors, and material suppliers, and all persons who
	provisions and supplies for the carrying on of such work, and all
taxes incurred on said Contract under Title 50 and	51 RCW and all taxes imposed on the Principal under Title 82
	en fulfilled, this bond shall remain in full force and effect.
The Surety agrees to indemnify defend and protect	t the County against any claim of direct or indirect loss resulting
from the failure of the Principal its heirs executors	administrators, successors, or assigns, (or the subcontractors or
lower tier subcontractors of the Principal) to pay a	Il laborers, mechanics, subcontractors, lower tier subcontractors
	uch contractor or supcontractors with provisions and supplies for
the carrying on of such work.	A land of the same
The Surety for value received agrees that no change	ge, extension of time, alteration or addition to the terms of the
	tract, or the work to be performed under the Contract shall in
	provided herein, and waives notice of any change, extension of
	ractor the work performed. The Surety agrees that modifications
	tract that increase the total amount to be paid the Principal shall
automatically increase the obligation of the surety of	n this bond and notice to Surety is not required for such increased
obligation.	
This bond may be executed in two (2) original counter	erparts, and shall be signed by the parties' duly authorized officers.
This bond will only be accepted if it is accompanied	by a fully executed and original power of attorney for the officer
executing on behalf of the suxety.	
The Surety agrees to be bound by the laws of the sta	te of Washington and subjected to the jurisdiction of the state of
Washington	
PRINCIPAL	SURETY
Principal Signature Date	Surety Signature Date
Printed Name	Printed Name
Title	Title
Local office/agent of Surety Company:	
Name	Telephone
Address	



PART 3 SUPPLEMENTARY GENERAL CONDITIONS AND GENERAL CONDITIONS

SUPPLEMENTARY GENERAL CONDITIONS

The General Conditions shall be supplemented as follows:

3.03.4(3) Apprentices

Add this Section in its entirety:

3.03.4(3.1) Apprentice Utilization

Apprentice Utilization

This Contract includes an Apprentice Utilization Requirement. Fifteen percent or more of project Labor Hours shall be performed by Apprentices unless Good Faith Efforts are accepted. Apprentice Utilization will be determined using the Department of Labor and Industries (L&I) online Prevailing Wage Intent & Affidavit (PWIA) system.

Definitions

For the purposes of this specification the following definitions apply:

- 1. <u>Apprentice</u> is a person enrolled in a State-approved Apprenticeship Training Program.
- 2. <u>Apprentice Utilization</u> is the apprentice labor hours, on the project, expressed as a percentage of project Labor Hours based on certified payrolls or the affidavits of wages paid, whichever is least. The percentage is not rounded up.
- 3. <u>Apprentice Utilization Requirement</u> is the minimum percentage of apprentice labor hours required by the Contract.
- 4. <u>Good Faith Effort(s) (GFE)</u> describes the Contractor's efforts to meet the Apprentice Utilization Requirement including but not limited to the specific steps as described elsewhere in this specification.
- 5. <u>Labor Hours</u> are the total hours performed by all workers receiving an hourly wage who are subject to prevailing wage requirements for work performed on the Contract as defined by RCW 39.04.310. Labor Hours are determined based on the scope of work performed by the individuals, rather than the title of their occupations in accordance with WAC 296-127.
- 6. <u>State-approved Apprenticeship Training Program</u> is an apprenticeship training program approved by the Washington State Apprenticeship Council.

7. <u>Apprentice Wage Rates</u> are the applicable wage rates that are to be paid for an apprentice registered in a training program, separate from Journey Level rates, as set by the Washington State Apprenticeship Training Council and Washington State Department of Labor and Industries (L&I).

Electronic Reporting

The Contractor shall use the PWIA System to submit the "Apprentice Utilization Plan." Reporting instructions are available in the application.

Apprentice Utilization Plan

The Contractor shall submit an "Apprentice Utilization Plan" by filling out the Apprentice Utilization Plan Form (WSDOT Form 424-004) within 30 calendar days of execution, however no later than the preconstruction meeting, demonstrating how and when they intend to achieve the Apprentice Utilization Requirement. The Plan shall be in sufficient detail for the Engineer to track the Contractor's progress in meeting the utilization requirements. An Apprentice Utilization Plan shall be updated and resubmitted as the Work progresses or when requested by the Engineer.

If the Contractor is unable to demonstrate the ability to meet the Apprentice Utilization Requirement with their initial Apprentice Utilization Plan submission, an effort must be made to find additional registered apprentices to perform on the contract. If after attempts have been made at every tier and every scope, the Contractor must submit GFE documentation to the Contracting Agency. The Contractor shall actively seek out opportunities to meet the Apprentice Utilization Requirement during the construction Work.

Contacts

The Contractor may obtain information on State-approved Apprenticeship Training Programs by using the <u>Apprentice Registration and Tracking System (ARTS)</u> https://secure.lni.wa.gov/arts-public/#/program-search or contacting the Department of Labor and Industries directly at:

Specialty Compliance and Services Division, Apprenticeship Section, P.O. Box 44530, Olympia, WA 98504-4530 or by phone at (360) 902-5320.

Compliance

The Contractor is expected to make attempts to employ Apprentices and shall include the requirement in any subcontracts at any tier. In the event that the Contractor is unable to achieve the Apprentice Utilization Requirement, the Contractor shall submit GFE documentation demonstrating the efforts and attempts they made. Final GFE documentation shall be submitted to the Contracting Agency after Substantial Completion but no later than 30 days after Physical Completion.

If the Contractor fails to actively attempt to employ Apprentices, submit GFE documentation, or if the Engineer does not approve the GFE, the Contractor will be assessed a penalty. The Engineer will provide the Contractor with a written notice at Final Acceptance of the project informing the Contractor of the failure to comply with this specification which will include a calculation of the penalty to be assessed as provided for in the Payment section in this special provision.

If the Contractor achieves the required Apprentice Utilization an incentive will be assessed with Final Payment.

Good Faith Efforts

The GFE shall document the attempts (efforts) the Contractor (and any subcontractor at any tier) made to meet the Apprentice Utilization Requirement. Emails, letters, or other written communications with letterhead, titles, and contact information are required.

Documentation must include one or more of the following accepted GFEs:

- 1. Demonstrated Lack of Availability of Apprentices. Correspondence from State-approved Apprenticeship Training Program(s), with project specific responses confirming there is a lack of availability of Apprentices for this project.
- 2. Demonstrated Disproportionate Ratio of Material/Equipment/Products to Labor Hours. Documentation explaining the bid includes a disproportionate high cost of material/equipment/products to Labor Hours. (E.g., a \$2 M estimated contract includes \$1 M or more in procurement costs of equipment to be installed.)
- 3. Demonstrated Lack of Necessary Labor Hours. Correspondence from a State-approved Apprentice Training Programs confirming there is not enough time in the project to meet required journey level to apprentice training ratios.
- 4. Demonstrated Lack of Available Approved Programs. Correspondence from State-approved Apprentice Training Programs, confirming there are no programs that train for the scopes included/anticipated on the project. Contractor and state programs to submit training program detail needs and details that could be used for future program creation.
- 5. Funding Precedent. Documentation that shows conflicting, more restrictive, or precedent requirements for other training on the Project. Examples include, but are not limited to, Tribal Employment Rights (TERO), Federal Training Hours, or Special Training that affect the ability to use state-registered apprentices.

- 6. Warranty Work. Documentation from Original Equipment Manufacturers, or similar, confirming that work performed must only be completed by certified journey-level installers or risk voiding warranty, or similar.
- 7. Other Effort. The Contractor may submit other evidence, documentation, or rationale for not being able to achieve the required Apprentice Utilization that are not covered in the other efforts named. Other efforts will still need to be corroborated by an independent, knowledgeable third-party.

Contractors may receive a GFE credit for graduated Apprentice hours through the end of the calendar year for all projects worked on as long as the Apprentice remains continuously employed with the same Contractor/subcontractor they were working for when they graduated. If an Apprentice graduates during employment on a project of significant duration, they may be counted towards a GFE credit for up to 1 year after their graduation or until the end of the project (whichever comes first). Determination of whether Contract requirements were met in good faith will be made by subtracting the hours from the journeyman total reported hours for the project and adding them to the apprentice hour total. If the new utilization percentage meets the Contract requirement, the Contractor will be reported as meeting the requirement in good faith.

Approving Good Faith Efforts

The Contracting Agency will review submitted Good Faith Efforts and issue a determination. The Engineer may request additional information, documentation, evidence or similar in order to approve such efforts. A determination by the Engineer is final. The approved Good Faith Efforts will be loaded into the PWIA system by the Contracting Agency.

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GENERAL CONDITIONS

SECTION 1 - GENERAL INFORMATION APPLICABLE TO PROPOSAL AND CONTRACT

1.01 DEFINITIONS AND TERMINOLOGY

The following terms are abbreviated and defined as they are used in the Contract. When used in the Proposal form to denote items of Work and units of measurements, abbreviations mean the full expression of the abbreviated term.

1.02 ABBREVIATIONS AND TERMINOLOGY

1.02.1 REFERENCED STANDARDS AND CODES

The following is a partial list of specifications and codes that may be referenced in sections of the Contract. The Contractor shall be responsible for conducting its Work and carrying out its operations and furnishing equipment in accordance with the latest edition or versions, in effect at the time of bid opening, of any applicable specified portions of the referenced standards and codes.

AASHTO American Association of State Highway and Transportation Officials

ACI American Concrete Institute

AFBMA Anti-friction Bearing Manufacturing Association

AGA American Gas Association

AGC Associated General Contractors of America

AI Asphalt Institute

AIA American Institute of Architects

AISC American Institute of Steel Construction

AISI American Iron and Steel Institute

AITC American Institute of Timber Construction
AMCA Air Moving and Conditioning Association
ANLA American Nursery and Landscape Association
ANSI American National Standards Institute, Inc.

APA American Plywood Association API American Petroleum Institute APWA American Public Works Association

ARA American Railway Association

AREMA American Railway Engineering and Maintenance-of-Way Association

ASA American Standards Association
ASCE American Society of Civil Engineers
ASLA American Society of Landscape Architects
ASME American Society Mechanical Engineers
ASNT American Society for Nondestructive Testing
ASTM American Society for Testing and Material
AWPA American Wood Preservers' Association

AWS American Welding Society

AWWA American Water Works Association

CFR Code of Federal Regulations

CLI Chain Link Institute

CRAB County Road Administration Board
CRSI Concrete Reinforcing Steel Institute
CSA Canadian Standards Associations
CSI Construction Specifications Institute
DIPRA Ductile Iron Pipe Research Association

EEI Edison Electric Institute

EPA Environmental Protection Agency ETL Electrical Testing Laboratories FHWA Federal Highway Administration

FM Factory Mutual

FSS Federal Specifications and Standards, General Services Administration

HUD United State Department of Housing and Urban Development

IBC International Building Code

ICEA Insulated Cable Engineers Association

IEEE Institute of Electrical and Electronic Engineers

IES Illumination Engineering Society

IMSA International Municipal Signal Association

IPC International Plumbing Code

ISA Instrumentation Society of America

JIC Joint Industry Conference Electrical Standards for Industrial Equipment

LID Local Improvement District
LPI Lightning Protection Institute
MSHA Mine Safety and Health Act

MSS Manufacturer's Standardization Society of the Valve and Fitting Industry

MUTCD Manual on Uniform Traffic Control Devices
NCMA National Concrete Manufacturer's Association

NEC National Electrical Code

NEMA National Electrical Manufacturers' Association

NEPA National Environmental Policy Act
NFPA National Fire Protection Association
NRMCA National Ready Mix Concrete Association

OMWBE Office of Minority and Women's Business Enterprises

OSHA Occupational Safety and Health Administration

PCA Portland Cement Association

PPI Plastic Pipe Institute

P/PCI Precast/Prestressed Concrete Institute

RCW Revised Code of Washington
SAE Society of Automotive Engineers
SEPA State Environmental Policy Act

SIES Specifications and Illuminating Engineering Society

SSPC Steel Structures Painting Council

UL Underwriters' Laboratory

ULID Utility Local Improvement District UMTA Urban Mass Transit Administration

WABO Washington Association of Building Officials

WAC Washington Administrative Code WCLIB West Coast Lumber Inspection Bureau

WISHA Washington Industrial Safety and Health Administration

WRI Wire Reinforcement Institute

WSDL&I Washington State Department of Labor and Industries

WSDOE Washington State Department of Ecology

WSDOT Washington State Department of Transportation

WWPA Western Wood Products Association

1.02.2 TERMINOLOGY

The use of pronouns of any gender in these General Conditions shall include pronouns of all genders, as applicable.

The terms "provide," "furnish" and "install" are used interchangeably in the Contract and mean that the Contractor shall provide, furnish, and install the item(s) described unless specifically noted otherwise.

The terms "Plans" and "Drawings" are used interchangeably in the Contract and shall mean the Contract Plans, which show location, character, and dimensions of prescribed Work, including layouts, profiles, cross-sections, and other details.

1.02.3 ITEMS OF WORK AND UNITS OF MEASUREMENT

AC Asbestos Cement Pipe

Agg. Aggregate Al. Aluminum

ATB Asphalt Treated Base

BST Bituminous Surface Treatment

CB Catch Basin

Cfm Cubic Feet per Minute Cfs Cubic Feet per Second

Cl. Class

CMP Corrugated Metal Pipe

Comb. Combination Conc. Concrete

CPEP Corrugated Polyethylene Pipe

Crib. Cribbing Culvert Culv. Cubic Yard(s) Cy or Cu. Yd. Dia. Diameter DΙ Ductile Iron DIM Dimension EA Each EL Elevation

Est. Estimate or Estimated

Excl. Excluding
F Fahrenheit
FIG Figure
Ft. Foot or Feet
GALV Galvanized

Gph Gallon(s) per Hour
Gpm Gallon(s) per Minute
HDPE High Density Polyethylene

HMA Hot Mix Asphalt

HR Hour
Hund. Hundred
In. Inch or Inches
Incl. Including
L Liter
Lb. Pound(s)

LF or Lin. Ft. Linear Foot (Feet)
LS Lump Sum

M Thousand

MBM Thousand Feet Board Measure

Pres. Pressure

PSI Pounds per Square Inch
PSF Pounds per Square Foot
PVC Polyvinyl Chloride

QTY Quantity Reg. Regulator

Reinf. Reinforced, Reinforcing SF Square Foot (Feet)

Sec. Section SL Slope St. Street Stl. Steel

SST Stainless Steel
Str. Structural
Sy or Sq. Yd. Square Yard(s)
Th. Thick or Thickness

TN Ton

Tr. Treatment
TYP Typical
VC Vitrified Clay

1.03 **DEFINITIONS**

ACCEPTANCE

The formal action by Owner or Owner's governing body as provided in RCW 39.08 and RCW 60.28, as existing or amended.

ADDENDUM

A written or graphic document issued to all Bidders prior to bid opening and identified as an addendum, which clarifies, modifies or supplements the bid documents and becomes part of the Contract.

ADDITIVE

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

ALTERNATE

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

AWARD

The formal decision of the Owner awarding the Contract to the lowest or most favorable responsible and responsive Bidder for the Work.

BID DOCUMENTS

The component parts of the proposed Contract which may include, but not limited to, the Proposal form, the proposed Contract Provisions, the proposed Contract Plans, Addenda, and Subsurface Boring Logs (if any).

BIDDER

A natural person or legal entity (e.g., partnership, corporation, limited liability company, firm, or joint venture) submitting a proposal or bid.

BUSINESS DAY

A business day is any day from Monday through Friday, except holidays, as listed in Section 3.04.14.

CLERK

The duly elected or appointed Clerk of the Commission, Council, or Board of Directors of the Owner or authorized designee.

COMMISSION, COUNCIL, OR BOARD OF DIRECTORS

The duly elected or appointed Council, Commission, or Board of Directors of the Owner.

CONTRACT

The written agreement between the Owner and the Contractor. It describes, among other things:

- 1. What work will be done, and by when;
- 2. Who will provide labor and materials; and
- 3. How Contractor will be paid.

The Contract includes: the agreement form, Bidder's completed Proposal form, all required certificates and affidavits, Performance Bond and Public Works Payment Bond, Contract Provisions, Contract Plans, and all Addenda and Change Orders executed pursuant to the provisions of the Contract.

CONTRACT BOND

The approved form of security furnished by the Contractor and the Contractor's Surety as required by the Contract, that guarantees performance of all the Work required by the Contract and payment to anyone who provides supplies or labor for the performance of the Work.

CONTRACT DOCUMENTS

See definition for "Contract."

CONTRACT PLANS (PLANS OR DRAWINGS)

The Contract Plans (or drawings) are those plans, drawings or other illustrations and all addenda and revisions, whether issued before or after the award of the Contract to Contractor, which show location, character, and dimensions of the Work, including layouts, profiles, cross-sections and other details.

CONTRACT PROVISIONS

A publication addressing the Work required for an individual project. At the time of the Call for Bids, the Contract Provisions may include, for a specific individual project, general conditions, supplemental general conditions, specifications, a listing of the applicable WSDOT Standard Plans, the prevailing minimum hourly wage rates, and an informational Proposal form with the listing of Bid items. The proposed Contract Provisions may also include, for a specific individual project, various required certifications or declarations. At the time of the Contract execution date, the Contract Provisions include the proposed Contract Provisions and include any Addenda, a copy of the agreement form, and a copy of the Proposal form with the Contract prices and extensions.

CONTRACT TIME

The period of time established by the terms and conditions of the Contract within which the Work shall be complete.

CONTRACTOR

The natural person(s) or legal entity (e.g., partnership, corporation, limited liability company, firm, joint venture) Contracting with the Owner to do the prescribed Work.

DATES

Substantial Completion Date is the day that the Engineer determines the Owner has full and unrestricted use and benefit of the Work, from both an operational and safety standpoint, any remaining traffic disruptions will be rare and brief, and only minor incidental work, replacement of temporary substitute facilities, plant establishment periods, or correction or repair remains for the physical completion of the total Work.

Physical Completion Date is the day that the Engineer determines that all of the Work required by the Contract is physically completed and the Owner has received from the Contractor all required record drawings, operation and maintenance manuals, manufacturers' affidavits, and software and programming.

Contract Completion Date is the day when all the Work and all the obligations of the Contractor under the Contract are fulfilled by the Contractor. All documentation and other items required by the Contract and required by law shall be furnished by the Contractor before establishment of this date.

Final Acceptance Date is the date on which the Owner accepts the Work as complete.

FIELD REPRESENTATIVE

The Owner's representative who observes the Contractor's performance of the Work. Such observation shall not be relied upon by the Contractor or others as approval or acceptance of the Work, nor shall it in any manner relieve the Contractor from its obligations and responsibilities under the Contract.

NOTICE TO PROCEED

The written notice from the Owner or Engineer to the Contractor authorizing and directing the Contractor to proceed with the Work and establishing the date on which the Contract Time begins.

OWNER

The government entity or agency that awards the Contract to the Contractor and is responsible for the execution and administration of the Contract.

PROJECT ENGINEER/ENGINEER

The Owner's representative who administers the construction program for the Owner.

PROPOSAL (or BID)

A Bidder's offer, on a properly completed Proposal form, to perform the Work required by the Contract. The terms Proposal and Bid may be used interchangeably.

SPECIFICATIONS

Written provisions describing the Work and requirements thereof.

STANDARD PLANS

A manual of specific plans or drawings adopted by the Owner, which show frequently recurring components of work that, have been standardized for use.

SUBCONTRACTOR

A natural person, or entity (e.g., partnership, corporation, limited liability company, firm or joint venture) to which the Contractor sublets a portion of the Work.

SUBGRADE

The top surface of the roadbed on which subbase, base, surfacing, pavement, or layers of similar materials are placed.

SUPPLEMENTARY GENERAL CONDITIONS

That part of the Contract amends or supplements these General Conditions.

TRAVELED WAY

That part of the roadway made for vehicle travel, excluding shoulders and auxiliary lanes.

WORK

The provision of all labor, materials, tools, equipment, supervision and other things needed to complete the project in full accordance with the Contract Documents.

WORKING DRAWINGS

Shop drawings, shop plans, erection plans, falsework plans, framework plans, cofferdam, cribbing and shoring plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data, including a schedule of submittal dates for working drawings where specified, that the Contractor shall submit to the Engineer for approval.

SECTION 2 - INSTRUCTIONS FOR PREPARATION OF PROPOSAL (OR BID)

2.01 BID PROCEDURES AND CONDITIONS

2.01.1 QUALIFICATIONS OF BIDDERS

Where applicable and required, Bidders shall provide all requested information relating to experience, financing, equipment, and organization relating to their ability to properly perform the Work. The Owner reserves the right to take whatever action it deems necessary to ascertain the responsibility of the Bidder and the ability of the Bidder to perform the Work satisfactorily.

2.01.2 CONTRACT PROVISIONS AND CONTRACT PLANS

Contract Provisions and Contract Plans are on file in the offices of the Owner and the Engineer, Gray & Osborne, Inc. After award of the Contract, up to five sets of Contracts will be issued without charge to the Contractor. Additional sets of Contracts may be purchased from the Owner by the Contractor.

2.01.3 ESTIMATED QUANTITIES

The quantities shown in the Proposal form are estimates and are stated only for bid comparison purposes. The Owner does not warrant, expressly or by implication, that the actual quantities will correspond with those estimates. Payment will be made on the basis of the actual quantities of each item of Work satisfactorily completed in accordance with the requirements of the Contract.

2.01.4 EXAMINATION OF CONTRACT AND SITE

2.01.4(1) General

Bidders shall satisfy themselves by personal examination of Contract Provisions, Contract Plans, and site of the proposed improvements, and by any other examination and investigation which they may desire to make as to the accuracy of the estimate of quantities, the nature of the Work and the difficulties to be encountered. Bidders shall review the entire Contract to ensure that the completeness of their Proposal includes all items of Work regardless of where shown in the Contract. Bidders are cautioned that alternate sources of information (copies of the Contract obtained from third parties) are not necessarily an accurate or complete representation of the Contract. Bidders shall use such information at their own risk.

Bidders shall be familiar and comply with all applicable federal, state, and local laws, ordinances, and regulations in any way applicable to the performance the Work. Bidders are responsible for familiarizing themselves with all current state and federal wage rates applicable to the Work and its duration before submitting a Proposal based on the Contract Provisions and Contract Plans. Any wage determination contained in the Contract is for the Bidder's general information only and is not warranted to be complete or accurate. The Owner will not consider any plea of misunderstanding or ignorance of such requirements. Bid prices shall reflect what the Bidder has determined to be the total cost of completing the Work, including but not limited to: construction methods, materials, labor, administrative costs, any and all applicable taxes, and equipment.

Except as the Contract may provide, the Bidder to which the Contract is awarded shall receive no payment for any costs that exceed those set forth in the Proposal.

2.01.4(2) Interpretation of the Contract Provisions and Contract Plans

If any Bidder desires interpretation or clarification of the Contract Provisions and Contract Plans, the Bidder shall make a written request to the Engineer for such clarification or interpretation prior to the submission of a Proposal. If the Engineer determines that the Contract Provisions and/or Contract Plans do not require interpretation or clarification, the Engineer will so notify the Bidder making the request. All interpretations and clarifications made by the Engineer will be by written addendum to all planholders of record, and a copy of the addendum will be filed in the office of the Owner. Neither the Owner nor the Engineer will be responsible for any interpretation, clarification or explanation of the Contract Provisions and Contract Plans that is not set forth in a written addendum to all planholders of record, and Bidders shall not under any circumstances rely on any other interpretation, clarification or explanation.

2.01.4(3) Subsurface Information

If the Owner has made a subsurface investigation of the site of the proposed Work, the boring log data and soil sample test data accumulated by the Owner will be made available for inspection by the Bidders. However, the Owner makes no representation or warranty, express or implied, that:

- a. The Bidders' interpretations from the boring logs may be correct;
- b. Moisture conditions and indicated water tables will not vary from those found at the time the borings were made;
- c. The ground at the location of the borings has not been physically disturbed or altered after the boring was made; and
- d. Conditions below the surface of the ground are consistent throughout the site with the information made available hereunder, or that conditions to be encountered on the site are uniform or consistent with geological conditions usually encountered in the area.

The Owner makes no representations, guarantees, or warranties as to the condition, materials, or proportions of the materials between the specific borings, regardless of any subsurface information the Owner may make available to the prospective Bidders. Bidders are solely responsible for making the necessary investigations to support and/or verify any conclusions or assumptions used in preparation of their Proposals.

Any subsurface investigations and analysis were carried out for design purposes only. Contractor may not rely upon or make any claim against Owner, Engineer, or any of their subconsultants, with respect to:

1. The completeness of such reports for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and

- procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
- 2. Other conclusions, interpretations, opinions, representations, and information contained in such reports; or
- 3. Any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, conclusions, interpretations, opinions or information.

2.01.4(4) Availability of Specified Items

Prior to submitting a Proposal, all Bidders shall verify that all items necessary to complete the Work will be available in time to allow the Work to be completed within the Contract Time. In the event that one or more items may not be available to allow the Work to be completed within the Contract Time, the Bidder shall notify the Engineer in writing prior to submitting a Proposal. Responsibility for delays and related costs because of non-availability of items necessary to complete the Work shall be borne by the Contractor.

2.01.5 PROPOSAL DEPOSIT

A deposit of at least 5 percent of the total Proposal amount shall accompany each Proposal (Proposal Deposit). The Proposal Deposit may be in the form of a Proposal bond (surety bond), certified check, cashier's check, or postal money order made payable to the Owner. All Proposal bonds shall be on the form included within the Contract Provisions and shall be signed by the Bidder and the surety. The surety shall: (1) be registered with the Washington State Commissioner, and (2) appear on the current Authorized Insurance List in the State of Washington published by the Office of the Insurance Commissioner. The Proposal bond shall not be conditioned in any way to modify the minimum 5 percent required. The Proposal Deposit will be held as a guaranty that the successful Bidder will, within 10 days from the date of notification of Award, enter into a Contract and furnish approved Performance and Public Works Payment Bonds, on forms attached, in amounts equal to 100 percent of the amount of the Contract, including state sales tax.

The failure to furnish a Proposal Deposit of a minimum of 5 percent with the Proposal shall make the Proposal non responsive and shall cause the Proposal to be rejected by the Owner.

2.01.6 PROPOSAL

- (1) Proposals shall be submitted on the Proposal form included in the Contract Provisions. All Proposals shall be completed, signed by an authorized person and dated. To be considered by the Owner as a responsive Proposal, the Bidder shall bid on all Additive or Alternate items set forth in the Proposal form, unless otherwise specified in the Contract Documents.
- (2) To be responsive, a Proposal shall state that it will remain valid for a period of 60 days following the date of Proposal opening. In the event that a conflict in this

- duration appears elsewhere in the Contract Provisions, the longest duration shall apply.
- All prices set forth on the Proposal form shall be legible and either be written in ink or typed. In the space provided on the Proposal form, Bidders shall identify all Addenda that have been received. The Proposal, Proposal Deposit, and all other certificates, forms or other documents required by the Contract Provisions to be executed and delivered with the Proposal shall be submitted in a sealed package, addressed to the Owner, and plainly marked "Proposal for ______ (insert name of project as shown on the Proposal) to be opened on the ______ day of _____, 20____," (insert the day, month and year shown in the published bid notice). The Owner will not consider any Proposal received after the time established for opening Proposals.
- (4) Where noted in the Proposal, the Bidder is to furnish information concerning its experience with work of a similar nature, equipment to be used on this project, and general background information. Information that is incomplete, evasive, or of a general nature only, may be considered as grounds for rejection of the Proposal.
- (5) RCW 39.30.060 requires Bidders on public works projects expected to cost one million dollars or more to provide the names of the structural steel installation, rebar installation, heating, ventilation and air conditioning, plumbing and electrical Subcontractors to whom the Bidder will directly subcontract those portions of the The Bidder may not list more than one Work if awarded the Contract. Subcontractor for each category of Work identified, unless Subcontractors vary with bid alternates, in which case the Bidder shall indicate which Subcontractor will be used for which alternate. Failure of the Bidder to list the names of such Subcontractors or to name itself to perform such Work, or listing two or more Subcontractors to perform the same Work, shall render the Bidder's Proposal unresponsive and void. Under RCW 39.30.060, the required names of such Subcontractors shall be provided with the Proposal or within one hour after the published Proposal submittal time. In addition to compliance with the requirements of RCW 39.30.060, the apparent successful Bidder may be required to submit to the Engineer as soon as possible after the Proposal opening, and not later than three calendar days thereafter, a written list of all proposed Subcontractors in addition to structural steel installation, rebar installation, heating, ventilation, and air conditioning, plumbing and electrical contractors, that will perform subcontracting Work on the project. If not previously provided, the following information shall be provided for each Subcontractor:
 - a. Name, address, email address, facsimile number, telephone number, contractor registration number and certification numbers;
 - b. The type of Work to be performed;

- c. A list of at least three recently completed projects for Work similar to that to be performed by the proposed Subcontractor, with the following information for each project:
 - i. Name of project,
 - ii. Name, address, and telephone number of the project owner; and
- d. Any additional pertinent information establishing the experience or qualifications of the proposed Subcontractor.
- (6) After opening and reading Proposals, the Owner will check them for correctness of extensions of the prices per unit and the total price. If a discrepancy exists between the price per unit and the extended amount of any bid item, the price per unit, converted to the actual extension, will control. The total extensions, corrected where necessary, will be used by the Owner for comparison and award purposes and to establish the amount of the Contractor's Performance and Public Works Payment Bonds.

2.01.7 WITHDRAWING OR REVISING PROPOSAL

After submitting a physical Proposal to the Owner, the Bidder may withdraw, or revise it if:

- 1. The Bidder submits a written request signed by an authorized person and physically delivers it to the place designated for receipt of Proposals; and
- 2. The Owner receives the request before the time set for receipt of Proposals; and
- 3. The revised or supplemented Proposal (if any) is received by the Owner before the time set for receipt of Proposals.

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

Late revised Proposals or late withdrawal requests will be date recorded by the Owner and returned unopened. Mailed, emailed, or faxed requests to withdraw or revise a Bid Proposal are not acceptable.

2.01.8 DISQUALIFICATION OF BIDDERS

- 1. A Proposal will be considered irregular and will be rejected if:
 - a. The Bidder is not prequalified when so required;
 - b. The Bidder adds provisions reserving the right to reject or accept the

- Award, or enter into the Contract;
- c. A price per unit cannot be determined from the Bid Proposal;
- d. The Proposal form is not properly executed;
- e. The Bidder fails to submit or properly complete a proposed subcontractor list, if applicable, as required in Section 2.01.6;
- f. The Bidder fails to submit, or properly complete a Disadvantaged Minority or Women's business Enterprise Certification, if applicable;
- g. The Bid Proposal does not constitute a definite and unqualified offer to meet the material terms of the Bid invitation.
- 2. A Proposal may be considered irregular and may be rejected if:
 - a. The Proposal does not include a unit price for every Bid item;
 - b. Any of the unit prices are excessively unbalanced (either above or below the amount of a reasonable Bid) to the potential detriment of the Contracting Agency;
 - c. The authorized Proposal Form furnished by the Contracting Agency is not used or is altered;
 - d. The completed Proposal form contains unauthorized additions, deletions, alternate Bids, or conditions;
 - e. Receipt of Addenda is not acknowledged;
 - f. A member of a joint venture or partnership and the joint venture or partnership submit Proposals for the same project (in such an instance, both Bids may be rejected); or
 - g. If Proposal form entries are not made in ink.
- 3. A Bidder will be deemed not responsible if the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1), as amended; or does not meet Supplemental Criteria 1 through 9 in this Section:

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

a. Criteria 1 – Federal Debarment

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

b. <u>Criteria 2 – Delinquent State Taxes</u>

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

c. <u>Criteria 3 – Subcontractor Responsibility</u>

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

d. Criteria 4 – Claims Against Retainage and Bonds

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

have had claims against retainage and bonds and include for each project the following information:

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

e. <u>Criteria 5 – Public Bidding Crime</u>

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

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

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

g. <u>Criteria 7 – Lawsuits</u>

- 1. <u>Criterion</u>: The Bidder shall not have lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, unless there are extenuating circumstances and such circumstances are deemed acceptable to the Owner.
- 2. <u>Documentation</u>: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the Owner) that the Bidder has not had any lawsuits with judgments

entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, or shall submit a list of all lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date, along with a written explanation of the circumstances surrounding each such lawsuit. The Owner shall evaluate these explanations to determine whether the lawsuits demonstrate a pattern of failing to meet of terms of construction related contracts.

h. Criteria 8 – Contract Time (Liquidated Damages)

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

i. <u>Criteria 9 – Capacity and Experience</u>

- 1. <u>Criterion</u>: The Bidder shall have sufficient current capacity and the Bidder, subcontractors, and project superintendent assigned to the project shall have experience to meet the requirements of this project. The Bidder, subcontractors, and the project superintendent shall meet the experience requirements as defined in Appendix A, Supplemental Bidder Responsibility Criteria.
- 2. <u>Documentation</u>: The Bidder shall, if and when required as detailed below, on a form to be provided by the Owner, provide the information requested in Appendix A documenting qualifications and experience. The Owner may check owner references for the previous projects and may evaluate the owner's assessment of the Bidder performance.

As evidence that the Bidder meets Supplemental Responsibility Criteria 2 through 9 stated above, the apparent two lowest Bidders must submit to the Owner by 12:00 P.M. (noon) of the second business day following the bid submittal deadline, a written statement verifying that the Bidder meets Supplemental Criteria 2 through 9 together with supporting documentation (sufficient in the sole judgment of the Owner) demonstrating compliance with Supplemental Responsibility Criteria 2

through 9. The Owner reserves the right to request further documentation as needed from the low bidder and documentation from other Bidders as well to assess Bidder responsibility and compliance with all bidder responsibility criteria. The Owner also reserves the right to obtain information from third-parties and independent sources of information concerning a Bidder's compliance with the mandatory and Supplemental Criteria, and to use that information in their evaluation. The Owner may consider mitigating factors in determining whether the Bidder complies with the requirements of the Supplemental Criteria.

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

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

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

2.01.9 PROPOSAL ERRORS

If a Bidder discovers an error in the Bidder's Proposal after the Proposals have been opened and tabulated and desires to withdraw the erroneous Proposal, the Bidder shall submit a notarized affidavit signed by the Bidder, accompanied by original certified worksheets used in the preparation of the Proposal, requesting relief from the Award. The affidavit shall describe the specific error(s) and certify that the worksheets are the originals used in the preparation of the Proposal.

The affidavit and the certified worksheets shall be received by the Engineer before 5:00 p.m. local time on the next business day following the day of the Proposal opening or the claim of error will not be considered. The Engineer will review the certified worksheets to determine the validity of the claimed error, and make its recommendation to the Owner. If the Owner and Engineer concur that the claim of error is allowable under applicable law, the Bidder will be relieved of responsibility for the Proposal, and the Proposal Deposit will be returned to the Bidder. Thereafter, at the discretion of the Owner, all Proposals may be rejected or an Award made to the next lowest responsive, responsible Bidder.

2.02 AWARD AND EXECUTION OF CONTRACT

2.02.1 AWARD OF CONTRACT

A Contract will not be awarded until the Owner is satisfied that the successful Bidder is responsible, reasonably familiar with the Work to be performed and has the necessary capital, tools, personnel and equipment to satisfactorily perform the Work.

The Owner reserves the right to waive informalities in the bidding, accept a Proposal of the lowest responsive, responsible Bidder, reject any or all Proposals, republish the call for Proposals, or revise or cancel the project.

After the date and hour set for the opening of the Proposals, no Bidder may withdraw its Proposal unless the Award of the Contract is delayed for a period exceeding 60 calendar days following Proposal opening. In the event that a conflicting duration appears elsewhere in the Invitation for Proposals or Contract Provisions or advertisement, the longer period shall govern.

2.02.2 EXECUTION OF CONTRACT

Within 10 calendar days after notification by the Owner of the Award, the successful Bidder shall return to the Engineer the signed Owner-prepared Contract, all insurance certificates and endorsements required by the Contract Provisions, all other certificates, information, and forms required by the Contract Provisions, and Performance and Public Works Payment Bonds required by the Contract Provisions. If the Contract is signed by an officer, agent, or other authorized representative of the Contractor, the officer, agent, or other representative shall furnish satisfactory evidence of authority to sign as the legal representative of the Contractor, if required by the Owner. An authorized partner of a joint venture may sign the Contract, subject to the approval of the Owner, which may, at its discretion, require each and every member of the joint venture to sign the Contract.

Should the successful Bidder fail to return to the Engineer the signed Owner-prepared Contract, all insurance certificates and endorsements required by the Contract Provisions, all other certifications, information, and forms required by the Contract Provisions, and Performance and Public Works Payment Bonds required by the Contract Provisions within 10 calendar days after notification by the Owner of the Award, the Owner reserves the right to and may elect to withdraw the award to the successful Bidder and award the Contract to the next responsible, responsive Bidder.

Until the Owner executes the Contract, no Proposal shall bind the Owner, and the Contractor shall not commence any Work. The Contractor shall bear all risks for any Work begun before the Contract is executed by the Owner.

2.02.3 FAILURE TO EXECUTE CONTRACT

If the Contractor fails to submit the insurance certificates, bonds, and all other certificates, forms, information and documents as required by the Contract Provisions, with the executed Contract within the time required by the Contract Provisions, the Owner may then award the Contract to the next lowest responsive, responsible Bidder or reject any or all Proposals.

2.02.4 RETURN OF PROPOSAL DEPOSIT

When Proposals have been examined and corrected as necessary, Proposal Deposits accompanying Proposals ineligible for further consideration will be returned. All other Proposal Deposits will be held until the Contract is awarded and fully executed, after which the Proposal Deposits, except those subject to forfeiture, will be returned.

2.02.5 NOTICE TO PROCEED

A written Notice to Proceed will be issued to the Contractor by the Owner or Engineer after the Contract has been executed by the Contractor and the Owner, and the Performance and Public Works Payment Bonds and required insurance and other certificates and documents are approved by the Owner and, when applicable, by State or Federal agencies responsible for funding any portion of the project. The Contractor shall not commence Work until the Notice to Proceed has been issued.

SECTION 3 - GENERAL REQUIREMENTS OF THE CONTRACT

3.01 SCOPE OF THE WORK

3.01.1 INTENT OF THE CONTRACT

The intent of the Contract is to describe a functionally complete project to be constructed in accordance with the Contract. The Contractor shall provide all labor, supervision, materials, tools, equipment, transportation, supplies, and other things required expressly by, or reasonably implied from, the Contract, to complete all Work. Omissions from the Contract of details of Work which are necessary to carry out the intent of the Contract, or which are customarily performed, shall not relieve the Contractor from performing the complete Work called for by the Contract; such Work shall be performed as if fully set forth and described in the Contract. The unit or other bid prices shall be full payment for everything required to complete the Work, including but not limited to labor, supervision, materials, equipment, jobsite and home office overhead and profit.

3.01.2 COORDINATION OF CONTRACT

The Contract Plans and the Contract Provisions for the Work shall be considered as a whole, and anything shown or called for in one and omitted in any other is as binding as if called for or shown on both. Figure dimensions shall, in all cases, be used in preference to scale dimensions. Any inconsistency in the Contract Documents shall be resolved by the following order of precedence (e.g., 1 presiding over 2 through 4, 2 presiding over 3 through 4, etc.):

- 1. Addenda;
- 2. The Agreement and Proposal Form;
- 3. Specifications;
- 3a. Supplementary General Conditions (including conditions supplied by federal or state agencies on projects funded, in whole or part, by such agencies. In the event of a conflict in various forms of General Conditions, those conditions affording the greatest benefit or protection to the Owner shall govern.);
- 3b. General Conditions;
- 3c. Technical Specifications;
- 4. Contract Plans.

3.01.3 ASSIGNMENT OF CONTRACT

The Contractor shall not assign the Contract or any part of the Contract or of the funds to be received under the Contract unless such assignment is approved by the Owner and the Contractor's Performance and Public Works Payment Bonds surety prior to the execution or effectiveness of the assignment.

3.02 CONTROL OF WORK

3.02.1 AUTHORITY AND ROLE OF THE ENGINEER

- (1) The Engineer is the authorized representative of the Owner, and is employed to act as advisor and consultant to the Owner in engineering matters relating to the Contract. Among other things, the Engineer may determine the quantity of material installed or Work completed, evaluate whether materials and equipment comply with the Specifications, and assist the Owner with answering questions relating to the meaning and intent of the Contract. The Owner, with the advice of the Engineer, will make the final determination relating to quality, acceptability and conformity of labor and materials to the requirements of the Contract.
- (2) The Engineer does not purport to be a safety expert, and is not engaged in that capacity under the Contract or the Engineer's contract with the Owner. The Engineer does not have either the authority or the responsibility to enforce construction safety laws, rules, regulations or procedures, or to order the stoppage of Work for claimed violations thereof. From time to time, the Engineer may inform the Contractor of conditions that may constitute safety issues or violations. Such information will be provided solely to cooperate with and assist the Contractor and shall not make the Field Representative or the Engineer responsible for the enforcement of safety laws, rules, regulations or procedures. After receiving information relating to safety issues from the Engineer, the Contractor shall make its own examination and analysis of the situation reported and take such action, if any, that the Contractor determines to be appropriate. The Engineer's performance of project representation and observation services shall not make the Engineer responsible for the enforcement of safety laws, rules, regulations or procedures; nor shall it make the Engineer responsible for construction means, methods, techniques, sequences, or procedures, or for the Contractor's failure to properly perform the Work, all of which are entirely the responsibility of the Contractor.
- (3) The Engineer shall have no liability whatsoever to, or contractual relationship with, the Contractor in any way relating to the Contract. The Owner and the Contractor shall look solely to each other for the enforcement with respect to any rights, obligations, claims or liabilities arising under or in any way relating to the Contract. Neither the authority given to the Engineer herein, nor any action or service provided by the Engineer or its subconsultants with regard to the Work, shall create any duty owed by the Engineer or its subconsultants to the Contractor or a cause of action against the Engineer or its subconsultants by Contractor.
- (4) Nothing in the Contract shall, in any way, be construed to place responsibility on the Field Representative, Engineer or the Owner for the method, manner, direction or superintendency of the performance of the Work by the Contractor. Such responsibility rests solely with the Contractor.

- (5) Neither the Engineer nor any of its assistants or agents shall have any power to waive any obligation of the Contract. The Engineer's failure to reject Work that is defective or otherwise does not comply with the requirements of the Contract shall not constitute approval or acceptance of the Work or relieve the Contractor of its obligations under the Contract, notwithstanding that such Work has been estimated for payment or that payments have been made for that Work. Neither shall such failure to reject Work, nor any acceptance by the Engineer or by the Owner of any part or of the whole of the Work bar a claim by the Owner at any subsequent time for recovery of damages for the cost of removal and replacement of any portions of the Work that do not comply with the Contract.
- (6) No order, measurement, determination or certificate by the Engineer or Owner for payment of money or payment for or acceptance of the whole or of any part of the Work by the Engineer or the Owner or extension of time or possession taken by the Owner shall constitute a waiver of any portion of the Contract, nor shall any waiver of any breach of the Contract constitute a waiver of any other or subsequent breach thereof.

3.02.2 AUTHORITY OF FIELD REPRESENTATIVE

- (1) Field Representatives are assigned to the project site to keep the Engineer and Owner generally informed as to the progress of the Work and the manner in which it is being done; to keep records; and to act as liaison between the Contractor, Owner and Engineer. When observed, the Field Representative shall call the attention of the Contractor to any deviations from the Contract. However, failure of the Field Representative to call the attention of the Contractor to faulty Work or deviations from the Contract shall not constitute either a waiver of any requirement in the Contract or acceptance of said Work.
- (2) Since one of the Field Representative's primary responsibilities is to observe that the Work progresses expediently and in a workmanlike manner, the Field Representative may offer suggestions to the Contractor, which the Contractor, at its sole discretion, may or may not choose to follow. Such suggestions are not to be considered as anything but suggestions offered to cooperate with and assist the Contractor and shall not constitute an assumption of responsibility, financial or otherwise, by the Field Representative, the Engineer or the Owner.
- (3) The presence or absence of the Field Representative on the job site will be at the sole discretion of the Owner, and the presence or absence of the Field Representative at any time will not relieve the Contractor of its responsibility to properly perform the Work as required by the Contract.
- (4) The Field Representative will have the authority, but not the obligation, to reject defective materials and equipment if observed; however, the failure of the Field Representative to reject defective materials and equipment or any other Work involving deviations from the Contract will not constitute acceptance of such Work. The Field Representative is not authorized to approve or accept any portion of the

Work or to issue instructions contrary to the Contract; all such approvals, acceptances or instructions shall be in writing and signed by the Engineer or the Owner.

(5) The Field Representative does not purport to be a safety expert, and is not engaged in that capacity under the Contract or the Engineer's contract with the Owner. The Field Representative does not have either the authority or the responsibility to enforce construction safety laws, rules, regulations or procedures, or to order the stoppage of Work for claimed violations thereof. From time to time, the Field Representative may inform the Contractor of conditions that may constitute safety issues or violations. Such information will be provided solely to cooperate with and assist the Contractor and shall not make the Field Representative or the Engineer responsible for the enforcement of safety laws, rules, regulations or procedures. After receiving information relating to safety issues from the Field Representative, the Contractor shall make its own examination and analysis of the situation reported and take such action, if any, that the Contractor determines to be appropriate. The Field Representative's performance of observation services shall not make the Field Representative responsible for the enforcement of safety laws, rules, regulations or procedures; nor shall it make the Field Representative responsible for construction means, methods, techniques, sequences, or procedures, or for the Contractor's failure to properly perform the Work, all of which are entirely the responsibility of the Contractor.

3.02.3 CONSTRUCTION OBSERVATION AND INSPECTIONS

- (1) All Work required by the Contract, including all materials and equipment to be furnished and the manufacture and preparation thereof shall, at all times, be subject to observation by the Owner's designated representatives, who may, at any time in the performance of their duties, enter upon the Work or the shops and factories where any part of the Work, materials or equipment are being prepared, fabricated or manufactured.
- (2) Observation of Work by the Owner, the Engineer, or the Field Representative shall not relieve the Contractor of its obligation to furnish satisfactory materials and workmanship. Work or materials found unsatisfactory at any time during the life of the Contract, and the applicable warranty periods, guarantees or limitation periods shall be promptly corrected or replaced immediately by the Contractor at its own expense.
- (3) Upon request by the Owner or Engineer, the Contractor shall furnish all tools, labor, equipment and materials necessary to examine any Work that may be completed or in progress, even to the extent of uncovering or taking down portions of completed or covered Work. Work shall be left exposed until examined by the Owner or Engineer, at no additional cost to the Owner. If the Owner or the Engineer determines that the uncovered Work does not comply with the requirements of the Contract, the cost of such examination and the cost of reconstruction and/or repair shall be borne by the Contractor.

(4) The Contractor shall promptly comply with all directions of the Engineer with reference to correcting any Work or replacing any materials or equipment found to be not in accordance with the Contract. In the event of a dispute, the Contractor may appeal to the Engineer's decision to the Owner in accordance with the Contract, and the Owner's decision shall be final.

3.02.4 EMERGENCY CONTACT LIST

The Contractor shall submit an emergency contact list to the Engineer no later than five calendar days after the date the Contract is executed. The list shall include, at a minimum, the Contractor's project manager or equivalent, project superintendent, traffic control supervisor, and erosion and sediment control lead. The list shall identify a representative with delegated authority to act as the emergency contact on behalf of the Contractor and include one or more alternates. The emergency contact shall be available upon the Engineer's request at other than normal working hours. The emergency contact list shall include 24-hour telephone numbers for all individuals identified as emergency contacts or alternates.

3.02.5 ORAL AGREEMENTS

No oral agreement or conversation with any officer, agent, or employee of the Owner, either before or after execution of the Contract, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Contract. Such oral agreement or conversation shall be considered as unofficial information and in no way binding upon the Owner, unless subsequently put in writing and signed by the Owner.

3.02.6 ELECTRONIC FILES

All Work performed shall be in conformity with the signed Contract Plans and Contract Provisions. If the Contractor requests electronic files, the Engineer may provide the files. The use of the electronic files shall be at the Contractor's sole risk. The Engineer does not warrant the completeness or accuracy of the electronic files and the Engineer assumes no liability for any errors or omissions in the digital data. The Contractor shall be responsible for reviewing and checking the electronic files to ensure that they are suitable for the Contractor's purpose.

3.03 LEGAL RELATIONS AND RESPONSIBILITIES

3.03.1 APPLICABLE LAWS AND REGULATIONS

3.03.1(1) General

The Contractor shall comply with all laws, ordinances, rules and regulations of any authority having jurisdiction in any way relating to the project, including, but not limited to, regulations governing site maintenance, clean-up, air pollution control, noise control, water quality control, surface water control and runoff, tree and vegetation protection, cultural resources and oil and hazardous substance control.

3.03.1(2) <u>Utilities and Similar Facilities</u>

The Contractor shall protect all private and public utilities from damage. Utilities include, among others: telephone lines; cable television and high-speed internet lines; gas; electric power lines; sanitary sewer; septic sewer systems; storm sewer, waterlines, and irrigation lines; street lighting and traffic signal and signing systems; and railroad tracks and related equipment.

In accordance with Chapter 19.122 of the Revised Code of Washington, the Contractor shall call the One-Number Locator Service for the field location of underground utilities. If no locator service is available for the area where the project is located, the Contractor shall provide written notice to all owners of utilities known to, or suspected of, having underground facilities within or near all areas of that will be excavated.

The Contractor shall be responsible for all costs required to protect public and private utilities from damage.

3.03.1(3) Site Maintenance

The Contractor shall keep the Work site, staging areas, and Contractor's facilities clean and free from rubbish and debris. Materials and equipment shall be removed from the Work site when they are no longer necessary. Upon completion of the Work and before final acceptance, the Work site shall be cleared of equipment, unused materials, and rubbish and the Work site shall be left in clean and neat condition.

3.03.1(4) State Taxes

The Washington State Department of Revenue has issued special rules on the State sales tax. Section 3.03.1(4) a through Section 3.03.1(4) c are meant to clarify those rules. The Contractor should contact the Washington State Department of Revenue for answers to questions in this area. The Owner will not adjust its payment if the Contractor bases a bid on a misunderstood tax liability.

The Contractor shall include all Contractor-paid taxes in the unit bid prices or other contract amounts. In some cases, however, state retail sales tax will not be included. Section 3.03.1(4) b describes this exception.

The Owner will pay the retained percentage only if the Contractor has obtained from the Washington State Department of Revenue a certificate showing that all contract-related taxes have been paid (RCW 60.28.051). The Owner may deduct from its payments to the Contractor any amount the Contractor may owe the Washington State Department of Revenue, whether the amount owed relates to the Contract or not. Any amount so deducted will be paid into the proper State fund.

a. State Sales Tax — Rule 171

WAC 458-20-171, and its related rules, apply to building, repairing, or improving streets, roads, etc., which are owned by a municipal corporation, or political

subdivision of the state, or by the United States, and which are used primarily for foot or vehicular traffic. This includes storm or combined sewer systems within and included as a part of the street or road drainage system and power lines when such are part of the roadway lighting system. For work performed in such cases, the Contractor shall include Washington State Retail Sales Taxes in the various unit bid item prices, or other contract amounts, including those that the Contractor pays on the purchase of the materials, equipment, or supplies used or consumed in doing the Work.

b. State Sales Tax — Rule 170

WAC 458-20-170, and its related rules, apply to the constructing and repairing of new or existing buildings, or other structures, upon real property. This includes, but is not limited to, the construction of streets, roads, highways, etc., owned by the state of Washington; water mains and their appurtenances; sanitary sewers and sewage disposal systems unless such sewers and disposal systems are within, and a part of, a street or road drainage system; telephone, telegraph, electrical power distribution lines, or other conduits or lines in or above streets or roads, unless such power lines become a part of a street or road lighting system; and installing or attaching of any article of tangible personal property in or to real property, whether or not such personal property becomes a part of the realty by virtue of installation.

For work performed in such cases, the Contractor shall collect from the Owner, retail sales tax on the full Contract price. The Owner will automatically add this sales tax to each payment to the Contractor. For this reason, the Contractor shall not include the retail sales tax in the unit bid item prices, or in any other contract amount subject to Rule 170, with the following exception.

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

c. Services

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

3.03.1(5) **Equal Employment Responsibilities**

The Contractor shall, at its sole cost and expense, comply with all applicable laws, policies and regulations pertaining to nondiscrimination and equal employment opportunities. The absence of specific provisions or other requirements mandated by state, municipal or federal laws, policies or regulations from these General Conditions shall not excuse the Contractor from compliance with such laws, regulations or policies.

3.03.1(6) Archaeological and Historical Objects

Archaeological or historical objects, such as ruins, human skeletal remains, sites, buildings, artifacts, fossils, or other objects of antiquity that may have significance from a historical or scientific standpoint, which may be encountered by the Contractor, shall not be further disturbed. The Contractor shall immediately notify the Engineer of any such finds.

The Engineer will determine if the material is to be salvaged. The Contractor may be required to stop work in the vicinity of the discovery until such determination is made. The Engineer may require the Contractor to suspend Work in the vicinity of the discovery until salvage is accomplished.

If the Engineer finds that the suspension of Work in the vicinity of the discovery increases or decreases the cost or time required for performance of any part of the Work under the Contract, the Engineer will make an adjustment in payment or the time required for the performance of the Work in accordance with Section 3.04.6.

3.03.2 SAFETY MEASURES

All Work under the Contract shall be performed in a safe manner. The Contractor and all Subcontractors shall comply with all applicable rules, regulations, and safety standards of the Washington State Department of Labor and Industries and all other federal, state, local and other governmental entities having jurisdiction over the project. The Contractor shall be solely and completely responsible for the conditions of the job site, including the safety of all persons and property during the performance of the Work. This requirement shall apply continuously and not be limited to normal working hours.

The Engineer's review of the Contractor's work plan, safety plan, construction sequences, schedule or performance does not and is not intended to include review or approval of the adequacy of the Contractor's safety measures in, on, or near the job site. The Engineer does not purport to be a safety expert, and is not engaged in that capacity under the Contract. The Engineer has neither the authority nor the responsibility to enforce construction safety laws, rules, regulations, or procedures, or to order the stoppage of Work for claimed violations thereof.

The Contractor shall exercise all required and appropriate precautions to protect all persons and property from injury and damage.

3.03.3 HAZARDOUS MATERIAL

Biological hazards and associated physical hazards may be present at the Work site. The Contractor shall take precautions and perform any necessary Work to provide and maintain a safe and healthful Work site in accordance with all applicable laws. The cost for all Work necessary to provide and maintain a safe Work site shall be included in the Contractor's Proposal, unless the Contract includes provisions to the contrary.

3.03.4 PAYMENT OF WAGES AND RELATED REQUIREMENTS

3.03.4(1) Minimum Prevailing Wage Requirements

- a. The Contract is subject to the minimum prevailing wage and hour requirements of RCW 39.12 and RCW 49.28 (as amended or supplemented). On projects having federal funding, federal wage laws and rules may also apply. The Contract may list minimum hourly rates for wages for trades or occupations in the locality within the state where such labor is performed as determined by the Industrial Statistician for the Department of Labor and Industries or under the federal Davis-Bacon Act. These rates are for general reference purposes only and may not be current or complete. The Contractor, any Subcontractor, or other person doing any Work under the Contract shall not pay any worker less than the applicable current minimum hourly wage rates required by applicable law. Higher wages and benefits may be paid.
- b. The Contractor, any Subcontractor, and all individuals or firms required by RCW 39.12, WAC 296-127, or the Federal Davis-Bacon and Related Acts (DBRA) to pay minimum prevailing wages, shall not pay any worker less than the minimum hourly wage rates and fringe benefits required by RCW 39.12 or the DBRA. Higher wages and benefits may be paid.
- c. In accordance with WAC 296-127, the applicable prevailing wage rates that are in effect on the date when Proposals are due shall remain in effect for the duration of the Contract. By incorporating prevailing wage rates into the Contract, the Owner does not warrant or imply that the Contractor will find labor available at those rates. The Contractor shall calculate in its Proposal any amounts above the minimums that it will actually have to pay. Further, rates for wages and/or fringe benefits may change while the Contract is in force. If they do, the Contractor shall bear the cost of paying rates above those in effect at time of bid.
- d. If employing labor in a class not listed in the Contract Provisions on State funded projects, the Contractor shall request the Industrial Statistician, Department of Labor and Industries to determine the correct wage and benefits rate.
- e. If employing labor in a class not listed in the Contract Provisions on a federally funded project, the Contractor shall request the U.S. Secretary of Labor to determine the correct wage and benefits rate.
- f. The Contractor shall ensure that any firm (Supplier, Manufacturer, or Fabricator) that falls under the provisions of RCW 39.12 because of the definition "Contractor" in WAC 296-127-010, complies with all the requirements of RCW 39.12.
- g. The Contractor shall be responsible for compliance with the requirements of the DBRA and RCW 39.12 by all firms (Subcontractors, lower tier Subcontractors, Suppliers, Manufacturers, or Fabricators) engaged in any part of the Work necessary to complete the Contract. Therefore, should a violation of this

Subsection occur by any firm that is providing Work or materials for completion of the Contract whether directly or indirectly responsible to the Contractor, the Owner will take action against the Contractor, as provided by the provisions of the Contract, to achieve compliance, including, but not limited to, withholding payment on the Contract until compliance is achieved.

3.03.4(2) Posting Notice Requirements

Notice of intent to pay prevailing wages and prevailing wage rates for the project shall be posted for the benefit of workers. The Contractor shall post the following, together with anything else necessary to comply with all applicable laws and regulations:

- a. One copy of the approved "Statement of Intent to Pay Prevailing Wages" for the Contractor, each Subcontractor, and any other firm (Supplier, Manufacturer, of Fabricator) that falls under the provisions of RCW 39.12 because of the definition of "Contractor" in WAC 296-127-010;
- b. One copy of the prevailing wage rates for the project;
- c. The address and telephone number of the Industrial Statistician for the Department of Labor and Industries, along with a statement that complaints and questions about wage rates may be directed there; and
- d. FHWA 1495/1495A "Wage Rate Information" poster if the project is funded with federal aid.

Notice shall be posted at a location readily visible to workers at the job site, or where no field office is established, at a local office. The Contractor shall supply a copy of the Notice to any employee upon request.

3.03.4(3) Apprentices

If employing apprentices, the Contractor shall submit to the Owner written evidence showing:

- a. That each apprentice is enrolled in a program approved by the Washington State Apprenticeship and Training Council;
- b. The progression schedule for each apprentice; and
- c. The established apprentice-journeyman ratios and wage rates in the project locality upon which the Contractor shall base such ratios and rates under the Contract. Any worker for whom an apprenticeship agreement has not been registered and approved by the Washington State Apprenticeship and Training Council shall be paid the prevailing hourly rate for journeymen provided in RCW 39.12.021.

3.03.4(4) Required Documents

1. General

All "Statements of Intent to Pay Prevailing Wages", "Affidavits of Wages Paid" and Certified Payrolls, including a signed Statement of Compliance for Federal-aid projects, shall be submitted on the State L&I online Prevailing Wage Intent & Affidavit (PWIA) system. Statements of Intent to Pay Prevailing Wages", and "Affidavits of Wages Paid" shall also be submitted to the Engineer. When requested by the Engineer, Certified Payrolls shall also be submitted to the Engineer.

2. Intents and Affidavits

On forms provided by the Industrial Statistician of State L&I, the Contractor shall submit to the Engineer the following for themselves and for each firm covered under RCW 39.12 that will or has provided Work and materials for the Contract:

- a. The approved "Statement of Intent to Pay Prevailing Wages" State L&I's form number F700-029-000. The Contracting Agency will make no payment under this Contract until this statement has been approved by State L&I and reviewed by the Engineer.
- b. The approved "Affidavit of Prevailing Wages Paid", State L&I's form number F700-007-000. The Contracting Agency will not grant Completion until all approved Affidavit of Wages paid for the Contractor and all Subcontractors have been received by the Engineer. The Contracting Agency will not release to the Contractor any funds retained under RCW 60.28.011 until "Affidavit of Prevailing Wages Paid" forms have been approved by State L&I and all of the approved forms have been submitted to the Engineer for every firm that worked on the Contract.

The Contractor is responsible for requesting these forms from State L&I and for paying any fees required by State L&I.

3. Certified Payrolls

Certified payrolls are required to be submitted by the Contractor for themselves, all Subcontractors and all lower tier Subcontractors. The payrolls shall be submitted weekly on all Federal-aid projects and no less than monthly on State funded projects.

4. Penalties for Noncompliance

The Contractor is advised, if these payrolls are not supplied within the prescribed deadlines, any or all payments may be withheld until compliance is achieved. In addition, failure to provide these payrolls may result in other sanctions as provided by State laws (RCW 39.12.050) and/or Federal regulations (29 CFR 5.12).

3.03.5 BONDS, INSURANCE AND INDEMNITY OBLIGATIONS

3.03.5(1) Contract Bonds

The successful Bidder shall provide an executed Performance Bond and Public Works Payment Bond for the full Contract amount (including sales tax). The Contract Bonds shall:

- 1. Be on Owner-furnished forms;
- 2. Be signed by an approved Surety (or Sureties) that:
 - a. Is registered with the Washington State Insurance Commissioner; and
 - b. Appears on the current Authorized Insurance List in the State of Washington published by the Office of the Insurance Commissioner.
- 3. Be conditioned upon the faithful performance of the Contract by the Contractor within the prescribed time; and
- 4. Be conditioned upon the payment of taxes, increases, and penalties incurred on the project under Titles 50, 51 and 82 RCW; and
- 5. Guarantee that the Surety shall indemnify, defend, and protect the Owner against any claim of direct or indirect loss resulting from the failure:
 - a. Of the Contractor (or any of the employees, Subcontractors, or lower tier Subcontractors of the Contractor) to faithfully perform the Contract; or
 - b. Of the Contractor (or the Subcontractors or lower tier Subcontractors of the Contractor) to pay all laborers, mechanics, Subcontractors, lower tier Subcontractors, material person, or any other person who provides supplies or provisions for carrying out the Work.
- 6. Be accompanied by a power of attorney for the Surety's officer empowered to sign the bond; and
- 7. Be signed by an officer of the Contractor empowered to sign official statements (sole proprietor or partner). If the Contractor is a corporation, the bond must be signed by the president or vice-president, unless accompanied by written proof of the authority of the individual signing the bond to bind the corporation (i.e., corporate resolution, power of attorney or a letter to such effect by the president or vice-president).

The Owner may require Sureties or Surety companies on the Contract Bonds to appear and qualify themselves. Whenever the Owner deems the Surety or Sureties to be inadequate, it may, upon

written demand, require the Contractor to furnish additional Surety to cover any remaining Work. Until the added Surety is furnished, payments on the Contract will stop.

3.03.5(1.1) Two-Year Guarantee Period

The Contractor shall return to the project and repair or replace all defects in workmanship and material discovered within 2 years following the Substantial Completion Date. The Contractor shall start work to remedy any such defects within 7 calendar days of receiving Owner's written notice of a defect, and shall complete such Work within the time stated in the Owner's notice. In case of an emergency, where damage may result from delay or where loss of services may result, such corrections may be made by the Owner's own forces or another contractor, in which case the cost of corrections shall be paid by the Contractor. In the event the Contractor does not accomplish corrections within the time specified, the Work will be otherwise accomplished and the cost of same shall be paid by the Contractor.

When corrections of defects are made, the Contractor shall then be responsible for correcting all defects in workmanship and materials in the corrected work for 2 years after acceptance of the corrections by Owner.

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

3.03.5(2) Worker's Benefits

- a. The Contractor shall make all payments required for unemployment compensation under RCW Title 50 and for industrial insurance and medical aid required under RCW Title 51. If any payment required by Title 50 or Title 51 is not made when due, the Contractor shall indemnify the Owner with respect to all costs and damages, including attorneys' fees and expenses, associated with such nonpayment. The Owner may retain payments due under Title 50 or Title 51 from any money due to the Contractor and make payment to the appropriate fund.
- b. The Contractor shall include in the various items in its bid Proposal all costs for payment of unemployment compensation and for providing the required insurance coverage(s). The Contractor will not be entitled to any additional payment for: (1) failure to include such costs in the Proposal, or (2) post-Award determinations made by the U.S. Department of Labor, the Washington State Department of Labor and Industries, or any other agency or entity regarding insurance coverage requirements.

3.03.5(4) Public Liability & Property Damage Insurance

3.03.5(4.1) General Requirements

A. The Contractor shall procure and maintain insurance described in all subsections in this Section, from insurers with a current A.M. Best rating not less than A - VII

and licensed to do business in the state of Washington. The Owner reserves the right to approve or reject the insurance provided, based on the insurer (including financial condition), terms and coverage, the Certificate of Insurance, and/or endorsements.

- B. The Contractor shall keep this insurance in force during the term of the Contract and for 30 days after the Physical Completion Date, unless otherwise indicated.
- C. All insurance coverage required by this section shall be written and provided by "occurrence-based" policy forms rather than by "claims made" forms.
- D. The insurance policies shall contain a "cross liability" provision.
- E. The Contractor's and all Subcontractors' insurance coverage shall be primary and non-contributory insurance as respects the Owner's insurance, self-insurance, or insurance pool coverage. Any insurance, self-insurance or self-insured pool coverage maintained by the Owner shall be excess of the Contractor's insurance and shall not contribute with it.
- F. The Contractor shall provide the Owner and all Additional Insured with written notice of any policy cancellation and the date of effective cancellation within 2 business days of receipt.
- G. The Contractor shall not begin work under the Contract until the required insurance has been obtained and approved by the Owner.
- H. Failure on the part of the Contractor to maintain the insurance as required shall constitute a material breach of Contract, upon which the Owner may, after giving 5 business days notice to the Contractor to correct the breach, immediately terminate the Contract or, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith, with any sums so expended to be repaid to the Owner on demand, or at the sole discretion of the Owner, offset against funds due the Contractor from the Owner.
- I. Under no circumstances shall a wrap up policy be obtained, for either initiating or maintaining coverage, to satisfy insurance requirements for any policy required under this Section. A "wrap up policy" is defined as an insurance agreement or arrangement under which all the parties working on a specified or designated project are insured under one policy for liability arising out of that specified or designated project.
- J. All costs for insurance shall be incidental to and included in the unit or lump sum prices of the Contract and no additional payment will be made.

3.03.5(4.2) Additional Insured

All insurance policies, with the exception of Workers Compensation, shall name the following listed entities as additional insured(s) using the forms or endorsements required herein:

- The Owner and its officers, elected/appointed officials, employees, agents, and volunteers;
- Gray & Osborne, Inc.;

The above-listed entities shall be additional insured(s) for the full available limits of liability maintained by the Contractor, irrespective of whether such limits maintained by the Contractor are greater than those required by the Contract, and irrespective of whether the Certificate of Insurance provided by the Contractor pursuant to 3.03.5(4.4) describes limits lower than those maintained by the Contractor.

3.03.5(4.3) Subcontractors

Contractor shall ensure that each Subcontractor of every tier obtains and maintains at a minimum the insurance coverages listed in 3.03.5(4.5)A and 3.03.5(4.5)B. Upon request of the Owner, the Contractor shall provide evidence of such insurance.

3.03.5(4.4) Verification of Coverage

The Contractor shall deliver to the Owner a Certificate(s) of Insurance and endorsements for each policy of insurance meeting the requirements set forth herein when the Contractor delivers the signed Contract for the Work. The certificate and endorsements shall conform to the following requirements:

- 1. An ACORD certificate or a form determined by the Owner to be equivalent. The certificate or an endorsement form shall indicate the Contractor's insurance is primary and non-contributory.
- 2. The Contractor shall obtain endorsement forms CG 2010 10 01, CG 2032 04 13 and CG 2037 04 13 or the equivalent of each, naming the Owner and all other entities listed in 3.03.5(4.2) as Additional Insured(s) and showing the policy number. If the Contractor is unsuccessful in securing these endorsements after exerting commercially reasonable efforts, the Contractor shall obtain other endorsements providing equivalent protection to the Additional Insured. Commercially reasonable efforts shall be evidenced by a signed statement by the Contractor's insurance broker indicating that endorsement forms CG 2010 10 01, CG 2032 04 13 and CG 2037 04 13 are not available and the endorsements submitted provide equivalent protection to the Additional Insured.
- 3. Any other amendatory endorsements to show the coverage required herein.
- 4. A notification of coverage enhancements on the Certification of Insurance shall not satisfy these requirements; actual endorsement must be submitted.

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

3.03.5(4.5) Coverages and Limits

The insurance shall provide the minimum coverages and limits set forth below. Providing coverage in these stated minimum limits shall not be construed to relieve the Contractor from liability in excess of such limits. All deductibles and self-insured retentions shall be disclosed and are subject to approval by the Owner. The cost of any claim payments falling within the deductible shall be the responsibility of the Contractor.

3.03.5(4.5)A Commercial General Liability

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

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

Contractor shall maintain Commercial General Liability Insurance arising out of the Contractor's completed operations for at least 3 years following Substantial Completion of the Work.

Such policy must provide the following minimum limits:

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

3.03.5(4.5)B Automobile Liability

Automobile Liability for owned, non-owned, hired, and leased vehicles, with an MCS 90 endorsement and a CA 9948 endorsement attached if "pollutants" are to be transported. Such policy(ies) shall provide the following minimum limit:

\$1,000,000 combined single limit each accident

3.03.5(4.5)C Workers' Compensation

The Contractor shall comply with Workers' Compensation coverage as required by the Industrial Insurance laws of the state of Washington.

3.03.5(4.5)D Excess or Umbrella Liability

The Contractor shall provide Excess or Umbrella Liability coverage at limits of \$2 million per occurrence and annual aggregate. This excess or umbrella liability coverage shall apply, at a minimum, to both the Commercial General and Auto insurance policy coverage and employers liability.

This requirement may be satisfied instead through the Contractor's primary Commercial General and Automobile Liability coverage, or any combination thereof.

3.03.5(4.5)E Builders Risk Insurance

The Contractor shall purchase and maintain Builders Risk insurance covering interests of the Owner, the Contractor, Subcontractors, and lower tier Subcontractors in the Work. Builders Risk shall be required for all structures on the project. A structure is any equipment, facility, building, bridge, retaining wall, or tank extending 4 feet or more above adjacent grade; or any facility less than 4 feet above adjacent grade, and containing more than \$50,000 worth of electrical or mechanical equipment. Poles, light standards, or antenna less than 50 feet in height and less than 2 feet in diameter shall not be considered structures. Builders Risk insurance, when required, shall be on an all-risk policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including flood, earthquake, theft, vandalism, malicious mischief and collapse. The Builders Risk insurance, when required, shall include coverage for temporary buildings, debris removal, and damage to materials in transit or stored off-site. Such insurance shall cover "soft costs" including but not limited to design costs, licensing fees, and architect's and engineer's fees. Builders Risk insurance shall be written in the amount of the completed value of the applicable portions of the project, with no coinsurance provisions.

The Builders Risk insurance covering the Work shall have a deductible of \$5,000 for each occurrence, which will be the responsibility of the Contractor. Higher deductibles for flood, earthquake and all other perils may be accepted by the Owner upon written request by the Contractor and written acceptance by the Owner. Any increased deductibles accepted by the Owner will remain the responsibility of the Contractor.

The Builders Risk insurance shall be maintained until the Physical Completion Date.

The Contractor and the Owner waive all rights against each other and any of their Subcontractors, lower tier Subcontractors, agents and employees, each of the other, for damages caused by fire or other perils to the extent covered by Builders Risk insurance or other property insurance applicable to the Work. The policies shall provide such waivers by endorsement or otherwise.

Liability for facilities not covered by Builders Risk shall remain the responsibility of the Contractor.

3.03.5(4.5)F LHWCA Insurance

If the Contract involves work on or adjacent to Navigable Waters of the United States, the Contractor shall procure and maintain insurance coverage in compliance with the statutory requirements of the U.S. Longshore and Harbor Workers' Compensation Act (LHWCA).

Such policy must provide the following minimum limits:

```
$1,000,000 Bodily Injury by Accident – each accident
$1,000,000 Bodily Injury by Disease – each employee
$1,000,000 Bodily Injury by Disease – policy limits
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3.03.5(4.5)G Protection and Indemnity Insurance Including Jones Act

If the Contract involves marine activities, or work from a boat, vessel, or floating platform, the Contractor shall procure and maintain Protection and Indemnity (P&I) coverage including collision liability, injury to crew (Merchant Marine Act of 1920 - Jones Act) and passengers, removal of wreck and liability for seepage, pollution, containment and cleanup using form SP-23 or SP 38 or a form as least as broad.

All entities listed under Section 3.03.5(4.2) of the General Conditions shall be named as additional insureds on the Contractor's Protection and Indemnity insurance policy.

Such policy must provide the following minimum limits:

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$1,000,000 Bodily Injury by Accident – each accident or occurrence
$1,000,000 Bodily Injury by Disease – each employee
$1,000,000 Bodily Injury by Disease – policy limits
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3.03.5(4.5)H Hull and Machinery

If the Contract involves use of a boat, vessel, or floating platform, the Contractor shall procure and maintain coverage at Market Value of vessel on American Institute Hull Clauses, 6/2/77 form.

3.03.5(4.5)I Marine Pollution

If this Contract is near or on water, the Contractor shall procure and maintain Pollution Liability (OPA, CERCLA) insurance to satisfy U.S. Coast Guard requirements as respects the Federal Oil Pollution Act of 1990 and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended.

Such policy must provide the following minimum limits, or statutory limits of liability as applicable, whichever is higher:

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$1,000,000 per Occurrence
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3.03.5(4.5)J Pollution Liability

If this Contract includes work with lead based paint, materials containing asbestos or transportation of hazardous materials, the Contractor shall provide a Contractors Pollution Liability policy, providing coverage for claims involving bodily injury, property damage (including loss of use of tangible property that has not been physically injured), cleanup costs, remediation, disposal or other handling of pollutants, including costs and expenses incurred in the investigation, defense, or settlement of claims, arising out of any one or more of the following:

- 1. Contractor's operations related to this project.
- 2. Remediation, abatement, repair, maintenance or other work with lead-based paint or materials containing asbestos.
- 3. Transportation of hazardous materials away from any site related to this project.

All entities listed under 3.03.5(4.2) of these general conditions shall be named by endorsement as additional insureds on the Contractors Pollution Liability insurance policy.

Such Pollution Liability policy shall provide the following minimum limits:

\$1,000,000 each loss and annual aggregate

3.03.5(4.5)K Professional Liability

If the Contract requires engineering design services, the Contractor and/or its Subcontractor(s) and/or its design consultant providing construction management, value engineering, or any other design-related non-construction professional services shall provide evidence of Professional Liability insurance covering professional errors and omissions.

Such policy shall provide the following minimum limits:

\$1,000,000 per claim and annual aggregate

If the scope of such design-related professional services includes work related to pollution conditions, the Professional Liability insurance shall include coverage for Environmental Professional Liability.

If insurance is on a claims made form, its retroactive date, and that of all subsequent renewals, shall be no later than the effective date of this Contract.

3.03.5(5) <u>Indemnity and Hold Harmless</u>

a. To the fullest extent permitted by law and subject to the limitations of RCW 4.24.115, the Contractor shall defend, indemnify and hold harmless the Owner and the Engineer and their appointed and elected officials, agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees and expenses arising out of or resulting from the negligent performance of the Work, provided that any such claim, damage, loss or expense

- (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and (2) is caused by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable. Provided, however, that when any such claim, damage, loss or expense arises from the concurrent negligence of (1) the Owner, or anyone for whose acts it may be liable, and (2) the Contractor, or anyone for whose acts it may be liable, it is expressly agreed that the Contractor's obligations of defense and indemnity under this section shall be effective only to the extent of the Contractor's negligence and those for whose negligence the Contractor is responsible. This obligation of indemnity shall not extend to claims, losses or expenses arising from the sole negligence of the Owner, its appointed or elected officials, agents or employees.
- b. In any and all claims against the Owner or the Engineer or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this section shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts, it being the expressed intent of the parties that Contractor herein specifically waives any immunity granted under the State Industrial Insurance Law, RCW Title 51. THIS WAIVER HAS BEEN SPECIALLY NEGOTIATED BY THE PARTIES, WHO HAVE ACKNOWLEDGED SAME BY AFFIXING THEIR SIGNATURES TO THE PROPOSAL FORM.

3.03.5(6) Patent Royalties & Process Fees

The Contractor shall be responsible for all costs arising from the use of patented devices, materials, or processes used in or incorporated in the Work. The Contractor agrees to indemnify, defend, and save harmless the Owner from all claims and damages, in any way relating to the use of patented devices, materials, or processes used in or incorporated in the Work.

3.03.6 METHOD OF SERVING NOTICE

All correspondence from the Contractor constituting any notification, notice of protest, notice of dispute, or other correspondence constituting notification required to be furnished under the Contract, shall be in paper format, hand delivered or sent via mail delivery service to the Owner. Electronic formats such as emails or electronically delivered copies of correspondence will not constitute such notice and will not comply with the requirements of the Contract.

3.04 PROSECUTION AND PROGRESS OF THE WORK

3.04.1 QUALITY OF WORK

3.04.1(1) Workmanship

- a. The Contractor represents that it is fully experienced and possesses all the necessary capital, facilities and expertise to perform all of the Work, and hereby guarantees that all of the Work performed by it under the Contract will be of the highest quality and done in a workmanlike fashion in strict accordance with the requirements of the Contract.
- b. The Contractor shall at all times employ skilled workers and use skilled Subcontractors in the performance of the Work. When required in writing by the Owner or the Engineer, the Contractor or its Subcontractors shall remove from the Work site any person or Subcontractor who is, in the opinion of the Owner or the Engineer, not competent, not qualified, disorderly, or otherwise unsatisfactory and shall not again employ such discharged person or Subcontractor on the Work, except with the prior written consent of the Owner. Discharge of any person or Subcontractor shall not be the basis of any claim for compensation or damages against the Owner or the Engineer.
- c. All Work performed under the Contract shall be of first quality workmanship throughout, with the Work complete and in full working order upon completion.
- d. Except when otherwise expressly specified in the Contract, the Contractor shall design, survey, layout and be responsible for all methods, materials and equipment used in performing the Work.
- e. If, at any time, the Contractor's workforce (including Subcontractors), in the opinion of the Owner and/or the Engineer, shall be inadequate for maintaining the necessary progress required to complete the Work within the Contract Time, the Contractor shall at its sole cost, if so required by the Owner and/or the Engineer, increase the workforce or equipment to such an extent as to give reasonable assurance of compliance with the Work schedule. The failure of the Owner and/or the Engineer to make such demand shall not relieve the Contractor of its obligation to perform the Work in accordance with the requirements of the Contract. The Contractor alone shall be responsible for the safety, efficiency and adequacy of its activities, construction methods and the rate of progress required by the Contract.

3.04.1(2) Contractor's Supervisory and Site Personnel

a. The Contractor shall assign sufficient supervisory personnel to ensure the faithful prosecution of the Work and shall have adequate supervisory personnel present at the Work site who are either employees of the Contractor or duly authorized representatives designated in writing to the Owner and/or the Engineer. The Contractor shall at all times maintain at the Work site a complete copy of the

- Contract Provisions, Contract Plans, and record drawings of the Work that has been completed.
- b. The Contractor shall at all times have at least one duly authorized supervisory representative at the Work site who shall be fully authorized to make binding decisions on behalf of the Contractor with respect to the Work. If the Contractor's duly authorized supervisory representative at the Work site will be absent from the Work site for more than four hours, he/she shall designate an assistant who possesses the same authority and so inform the Owner and the Field Representative, if applicable.

3.04.2 MATERIALS AND EQUIPMENT

- (1) Materials and equipment furnished and installed shall be manufactured, fabricated or constructed to meet all applicable safety requirements. All material and equipment supplied by the Contractor and incorporated in the Work shall be of new manufacture, free from defects and in strict compliance with the requirements of the Contract. When required by the Owner, a certificate from the manufacturer or other responsible supplier shall be supplied attesting to this fact.
- (2) All tools and equipment used for construction operations shall be of the size and type suitable for the Work and shall be kept in safe and good working condition at all times.
- (3) The Contractor shall, whenever required during the progress of the Work and after completion of the Work, furnish proof acceptable to the Owner that all items of equipment and all materials installed equal or exceed all requirements specified in the Contract.
- (4) The Contractor shall use all means possible to protect materials and equipment from damage or degradation of any kind before, during and after installation.
- (5) The Contractor shall replace any materials or equipment damaged during the performance of the Work to the approval of the Owner and the Engineer. The cost of replacing damaged materials and equipment shall be borne by the Contractor.

3.04.3 SPECIFICATION OF PARTICULAR MATERIALS AND EQUIPMENT

- (1) Within the Contract, certain items are specified by brand, style, trade name, or manufacturer in order to set forth a standard of quality, and/or preference by the Owner. Unless specifically noted otherwise, it is not the intent of the Contract to exclude other processes or materials of a type and quality equal to those designated.
- (2) The term "or equal" as used in the Contract does not mean that the Contractor's substitution of material or equipment will necessarily be approved as equal by the Engineer. If the Contractor desires to substitute material or equipment on the basis that it is equal to that specified, the Contractor shall submit a written request to the

Engineer to substitute the material or equipment. The Contractor shall not use or incorporate such material or equipment into the Work until the Contractor has received written approval from the Engineer.

- (3) If the Contractor proposes substitutions, the Engineer will record all time used to evaluate each proposed substitution. If an approved substitution requires revisions to the Contract Documents, the Engineer will record all time to accomplish the revisions. Whether or not the Engineer approves a proposed substitution all direct and indirect cost to evaluate the proposed substitution shall be deducted from amounts due or to become due to the Contractor.
- (4) No additional compensation or extension of time will be allowed the Contractor for any changes required to incorporate substituted materials or equipment.

3.04.4 STORAGE

3.04.4(1) On-Site Storage

The Contractor shall store all equipment and materials in a safe and suitable place in accordance with the manufacturer's recommendations. Materials and equipment shall be covered or wrapped to protect them from moisture, dust and deterioration, as required or necessary. All on-site storage areas shall be approved in advance by the Owner and the Engineer.

3.04.4(2) Off-Site Storage

The Contractor may be required to provide offsite storage of equipment and materials to enable construction to occur at the Work site. The Contractor has full responsibility to secure all offsite storage areas, if needed, and shall include the costs for providing such storage areas in the bid Proposal for the individual equipment and material items requiring off-site storage. All off-site storage areas shall be enclosed or fenced and be secure.

3.04.5 DEFECTIVE MATERIALS, EQUIPMENT AND WORKMANSHIP

- (1) Materials, equipment, or workmanship which, in the opinion of the Owner or the Engineer, does not conform to the Contract or are in any other way unsatisfactory or unsuited to the purpose for which they are intended may be rejected. The Contractor shall remove from the Work site without delay, all rejected materials, equipment and work, and shall promptly replace the same in strict conformity with the requirements of the Contract. Unsatisfactory materials, equipment and workmanship may be rejected at any time, notwithstanding any previous testing, inspection or acceptance of such materials, equipment or workmanship, or inclusion thereof in any previously issued progress estimates.
- (2) If the Contractor fails to correct defective Work, equipment or materials, the Owner shall have the right to exercise any of the following options or any combination thereof:

- a. The Owner may replace the defective Work, materials or equipment by purchase from or contract with any other parties at the expense of the Contractor, and in this event, the Owner shall be entitled without compensation to the Contractor, to the use of the defective Work or equipment for such reasonable time as is necessary to enable Owner to replace such defective Work, materials or equipment.
- b. The Owner may elect to accept the defective Work, materials or equipment and issue a Change Order reflecting a credit against the Contract price, computed under the terms of the Contract in an amount to be determined by the Engineer, which amount shall reflect the actual value to the Owner of the accepted Work.
- c. Upon receipt of notice from the Owner of any defects in material, equipment or workmanship which appear within a two-year period following the Substantial Completion Date, or within any other warranty or guarantee period required by the Contract or provided by a manufacturer or supplier, the Contractor shall promptly and with the least possible delay and inconvenience to the Owner, repair or replace such defective workmanship, material or equipment without expense to the Owner.
- d. The Contractor shall be responsible for the full cost of correcting defective Work and complying with warranties and guarantees as required by the Contract. Direct or indirect costs, including administrative and engineering, incurred by the Owner attributable to correcting and remedying defective or unauthorized work, or Work the Contractor failed or refused to perform, shall be paid by the Contractor. Payment will be deducted by the Owner from monies due, or to become due, the Contractor. Such direct and indirect costs shall include in particular, but without limitation, compensation for additional professional services required, and costs for repair and replacement of work of others destroyed or damaged by correction, removal, or replacement of the Contractor's unauthorized work.
- e. All warranties, guarantees, and other obligations to correct work that does not comply with the Contract are material requirements of the Contract. The performance of all warranties, guarantees and other obligations shall be secured by the Performance Bond and the Public Works Payment Bond submitted by the Contractor at the time the Contract is signed.

3.04.6 CHANGES IN THE WORK

(1) The Owner or the Engineer may, at any time, without notice to the Performance Bond or Public Works Payment Bond sureties, by written order designated or indicated to be a Change Order or Change Directive, make any change, including modifications to, additions to or deletions from the Work including, but not limited to, changes:

- a. To the Contract Provisions and Contract Plans;
- b. To quantities or performance of the Work;
- c. To Owner-furnished facilities, equipment, materials, services or the Work site; or
- d. To the schedule for the Work or the Contract Time.
- (2) A Change Order is an amendment to the Contract, which signifies changes in the scope of the Work, the Contract Time, and/or the Contract price. A Change Order shall be the complete expression of the agreement between the Owner and the Contractor. No claims or entitlement to an equitable adjustment or changes to the Contract Time and/or Contract price will be allowed for alleged verbal or oral agreements or directives.
- (3) The Engineer will issue a written change order for any change. If the Engineer determines that the change increased or decreased the Contractor's costs or time to do any of the Work, the Engineer will make an equitable adjustment to the Contract. The equitable adjustment will be by agreement with the Contractor. However, if the parties are unable to agree, the Engineer will determine the amount of the equitable adjustment in accordance with Section 3.04.6(7) and adjust the time as the Engineer deems appropriate. Extensions of time will be evaluated in accordance with Section 3.04.15(2).

The Contractor shall proceed with the Work upon receiving:

- 1. A written change order approved by the Owner; or
- 2. An oral order from the Engineer before actually receiving the written change order.

Within 14 calendar days of delivery of the change order the Contractor shall endorse and return the change order, request an extension of time for endorsement or respond in accordance with Section 3.04.8. The Owner may unilaterally process the change order if the Contractor fails to comply with these requirements. Changes normally noted on field stakes or variation from estimated quantities, except as provided in Section 3.04.6(8), will not require a written change order. These changes shall be made at the unit prices that apply. The Contractor shall respond immediately to changes shown on field stakes without waiting for further notice.

The Contractor shall obtain written consent of the Surety or Sureties if the Engineer requests such consent.

(4) All Change Orders will be prepared by the Owner or Engineer and executed in triplicate with one copy to the Owner, one to the Contractor, and one retained by the Engineer.

- (5) If the Contractor encounters any circumstances during the performance of the Work that the Contractor contends creates any entitlement to a change in the Contract Time, the Contract price, or both, the Contractor shall immediately provide written notice to the Engineer. Within 10 calendar days after providing written notice, the Contractor shall provide a written request to the Engineer for a change to the Contract Time and/or Contract price and provide detailed information supporting the request, including cost and schedule information.
- (6) No claim by the Contractor shall be allowed if the terms of this Section 3.04.6 are not strictly followed. In the event of any non-compliance, the Contractor shall be conclusively determined to have waived any claim or entitlement to an adjustment of the Contract Time or the Contract price.
- (7) The cost to be included in an adjustment for any changes to the Work, adjustment of the Contract Time or Contract price and any equitable adjustment or entitlement related to the Work or the Contract shall meet the notice provisions of Section 3.04.6, and will be determined strictly by one or a combination of the following methods:
 - a. Contract unit bid prices previously agreed upon; or
 - b. If there are no unit bid prices, an agreed lump sum; or
 - c. If the amount of the adjustment cannot be agreed upon in advance or in the manner provided in subparagraph a or b above, the cost will be determined by the actual cost of:
 - 1. Labor including working foremen. Labor rates will only include the basic wage and fringe benefits, the current rates for Federal Insurance Compensation Act (FICA), Federal Unemployment Tax Act (FUTA) and State Unemployment Tax Act (SUTA), and the company's present rates for medical aid and industrial insurance premiums. Labor reimbursement calculations will be based on a "Labor List" (List) prepared and submitted by the Contractor and any Subcontractor before the Contractor commences force account Work. The Engineer may compare the List to payrolls and other documents and may at any time, require the Contractor to submit a new List.

In the event that an acceptable List is not received by the time that force account calculations are begun, the Engineer will develop a List unilaterally, utilizing the best data available.

2. Materials incorporated permanently into the Work;

- 3. The ownership or rental cost of equipment during the time of use on the extra work. Equipment rates shall be as set forth in the then current AGC/WSDOT Equipment Rental Agreement. These rates shall be full compensation for all costs incidental to furnishing and operating the equipment. The Contractor shall submit copies of the applicable portions of the AGC/WSDOT Equipment Rental Agreement to the Engineer. The rates listed in the Rental Rate Blue Book (as modified by the current AGC/WSDOT Equipment Rental Agreement) shall be full compensation for all fuel, oil, lubrication, ordinary repairs, maintenance, and all other costs incidental to furnishing and operating the equipment except labor for operation; plus
- 4. For Services: compensation under force account for specialized services shall be made based on an invoice from the providing entity. Before Work is started the Engineer may require the Contractor to obtain multiple quotations for the service to be utilized and select the provider with the prices and terms most advantageous to the Contracting Agency. The following activities will be considered services and shall be compensated based on an invoice from the entity:
 - a. Biohazard abatement services
 - b. Camera Inspection services for Sewer/Storm sewer
 - c. Commissioning services including manufacturing startup services
 - d. Contaminated water and soil disposal fees including lab analysis
 - e. Geotechnical Engineering services
 - f. Laboratory Testing
 - g. Professional Engineering Services
 - h. Sanitation Services such as trash or restroom services
 - i. Sawcutting
 - i. Security of Surveillance Services
 - k. Surveying including aerial surveying
 - l. Vacuum Truck
 - m. Water Truck
 - n. Well Decommissioning

5. Overhead and Profit as follows:

For Work performed by the Contractor, an amount to be agreed upon but not to exceed 15 percent of the labor, material, and equipment cost agreed to by the Engineer as compensation for supervision, small tools, provisions for safety, home office and field overhead, profit and other general conditions expenses, including, but not limited to, insurance, bond and business and occupation taxes. For Subcontractor Work, the Subcontractor will be allowed an amount to be agreed upon but not to exceed 15 percent of the labor, material, service, and equipment cost agreed to by the Engineer as compensation for supervision, small tools, provisions for safety, home office and field overhead, profit and other general conditions expenses, including, but not limited to, insurance, bond and business and occupation taxes. The Contractor will be allowed an additional markup of 10 percent to compensate the Contractor for all administrative costs, including home office and field overhead, profit, bonding, insurance, business and occupation taxes and any other costs incurred.

In no case will the total fixed fee for the Contractor and all Subcontractors of all tiers exceed 30 percent.

(8) Payment to the Contractor will be made only for the actual quantities of Work performed and accepted in conformance with the Contract. When the accepted quantity of Work performed under a unit item varies from the original bid quantity, payment will be at the unit Contract price for all Work unless the total accepted quantity of any Contract item, adjusted to exclude added or deleted amounts included in change orders accepted by both parties, increases or decreases by more than 25 percent from the original bid quantity, and that bid item represents 10 percent or more of the total original Contract price. In that case, payment for Contract Work may be adjusted as described herein.

The adjusted final quantity shall be determined by starting with the final accepted quantity measured after all Work under an item has been completed. From this amount, subtract any quantities included in additive change orders accepted by both parties. Then, to the resulting amount, add any quantities included in deductive change orders accepted by both parties. The final result of this calculation shall become the adjusted final quantity and the basis for comparison to the original Proposal quantity.

- a. **Increased Quantities**. Either party to the Contract will be entitled to renegotiate the price for that portion of the adjusted final quantity in excess of 1.25 times the original Proposal quantity, if 10 percent or more of the original Contract price. The price for excessive increased quantities will be determined by agreement of the parties, or, where the parties cannot agree, the price will be determined by the Engineer based upon the actual costs to perform the Work, including reasonable markup for overhead and profit. The final price will be determined by the Engineer.
- b. **Decreased Quantities**. Either party to the Contract will be entitled to an equitable adjustment if the adjusted final quantity of Work performed is less than 75 percent of the original Bid quantity, if 10 percent or more of the original Contract price. The Contractor shall submit the documentation to

support the equitable adjustment to the Engineer. The equitable adjustment shall be based upon and limited to three factors:

- 1. Any increase or decrease in unit costs of labor, materials or equipment, utilized for Work actually performed, resulting solely from the reduction in quantity;
- 2. Changes in production rates or methods of performing Work actually done to the extent that the nature of the Work actually performed differs from the nature of the Work included in the original plan; and
- 3. An adjustment for the anticipated contribution to unavoidable fixed cost and overhead from the units representing the difference between the adjusted final quantity and 75 percent of the original plan quantity.

The following limitations shall apply to renegotiated prices for increases and/or equitable adjustments for decreases:

- 1. The equipment rates shall be actual cost but shall not exceed the rates set forth in the AGC/WSDOT Equipment Rental Agreement.
- 2. No payment will be made for extended or unabsorbed home office overhead and field overhead expenses to the extent that there is an unbalanced allocation of such expenses among the Contract Bid items.
- 3. No payment for consequential damages or loss of anticipated profits will be allowed because of any variance in quantities from those originally shown in the Proposal form, Contract Provisions, and Contract Plans.
- 4. The total payment (including the adjustment amount and unit prices for Work performed) for any item that experiences an equitable adjustment for decreased quantity shall not exceed 75 percent of the amount originally Bid for the item.

If the adjusted final quantity of any item does not vary from the quantity shown in the Proposal by more than 25 percent, then the Contractor and the Owner agree that all Work under that item will be performed at the original Contract unit price.

When ordered by the Engineer, the Contractor shall proceed with the Work pending determination of the cost or time adjustment for the variation in quantities.

The Contractor and the Owner agree that there will be no cost adjustment for decreases if the Owner has entered the amount for the item in the Proposal form only to provide a common Proposal for Bidders.

3.04.7 DIFFERING SITE CONDITIONS

The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of: (1) pre-existing subsurface or latent physical conditions at the Work site that differ materially from those indicated in the Contract Documents, or (2) pre-existing unknown physical conditions at the Work site, of an unusual nature, that differ materially from those ordinarily encountered and generally recognized as inherent in the Work of the character required by the Contract. The Engineer shall be given an opportunity to examine such conditions in order to advise the Owner of possible modifications to the Work to mitigate such conditions. If the Engineer determines that conditions are materially different and cause a material increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, an equitable adjustment shall be made in the Contract Time and/or Contract price in accordance with other applicable provisions of the Contract relating to changes in the Work. Failure of the Contractor to give notice of such conditions at the time of discovery shall constitute a waiver of any claim for an equitable adjustment. Any such adjustments to the Contract price shall be computed strictly limited to amounts provided under paragraph 3.04.6.

3.04.8 PROTEST BY THE CONTRACTOR

If the Contractor disagrees with anything in a Change Order or a written directive, or with any interpretation or determination by the Engineer, the Contractor shall:

- a. Immediately submit a signed written notice of protest to the Engineer before doing the Work;
- b. Supplement the written protest within 14 calendar days with a written statement and supporting documents providing the following:
 - 1. The date and nature of the protested order, direction, instruction, interpretation or determination;
 - 2. A full discussion of the circumstances which caused the protest, including names of persons involved, time, duration, and nature of the Work involved and a review of the Plans and Contract Provisions referenced to support the protest;
 - 3. The estimated dollar cost, if any, of the protested Work and a detailed breakdown showing how that estimate was determined; and
 - 4. An analysis of the progress schedule showing the schedule change or disruption if the Contractor is asserting a schedule change or disruption; and

5. If the protest is continuing, the information required above shall be supplemented upon request by the Engineer until the protest is resolved.

The Contractor shall keep detailed and complete records of extra costs and schedule impacts to Contract Time that in any way relate to a protest. The Contractor shall allow the Engineer to have access to all documents and records needed for evaluating the protest.

The Engineer will evaluate all protests that comply with this Section. If the Engineer determines that a protest is valid, the Engineer will adjust the Contract price and/or the Contract Time by an adjustment in accordance with Section 3.04.6 and 3.04.15(2).

During the time when any protest is pending, the Contractor shall proceed promptly with the Work, as the Engineer orders in writing.

The Contractor's failure to submit a protest in strict accordance with the requirements of this Section shall constitute a waiver of any claim for an adjustment to the Contract Time, the Contract price, or other relief.

3.04.9 SUBCONTRACTORS AND SUBCONTRACTS

3.04.9(1) Contractor Responsibility

Nothing contained in the Contract shall create any contractual or other relationship between the Owner and/or the Engineer and any Subcontractor or lower tier Subcontractor, and no performance undertaken by any such Subcontractor or lower tier Subcontractor shall, under any circumstances, relieve the Contractor of its obligations and responsibilities under the Contract.

Prior to subcontracting any Work, the Contractor shall verify that every first tier Subcontractor meets the responsibility criteria stated below at the time of subcontract execution. The Contractor shall include these responsibility criteria in every subcontract, and require every Subcontractor to:

- 1. Possess any electrical contractor license required by 19.28 RCW or elevator contractor license required by 70.87 RCW, if applicable;
- 2. Have a certificate of registration in compliance with Chapter 18.27 RCW;
- 3. Have a current State unified business identifier number;
- 4. If applicable, have:
 - a. Industrial insurance coverage for the Subcontractor's employees working in Washington (Title 51 RCW);
 - b. An employment security department number (Title 50 RCW);
 - c. A state excise tax registration number (Title 82 RCW).

- 5. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or RCW 39.12.065(3);
- 6. Verify these responsibility criteria for every lower tier subcontractor at the time of subcontract execution; and
- 7. Include these responsibility criteria in every lower tier subcontract.

3.04.9(2) Contractor Work Performance Requirement

Work done by the Contractor's own organization shall account for at least 30 percent of the awarded Contract price.

3.04.9(3) Approval of Subcontractors

The Contractor shall not subcontract Work unless the Engineer approves in writing. Each request to subcontract shall be on the form the Engineer provides. If the Engineer requests, the Contractor shall provide proof that the Subcontractor has the experience, ability, and equipment the Work requires. The Contractor shall require each Subcontractor to comply with Section 3.03.4 and to furnish all certificates and statements required by the contract. Approval of a Subcontractor by the Owner shall not relieve the Contractor or Subcontractor of any obligations or responsibilities under the Contract. Any delays or other impacts caused by the failure of the Contractor to provide required information and obtain approval of any Subcontractor in a timely manner will not be considered as justification for additional compensation or an extension of the Contract Time.

3.04.9(4) Subcontracts

Upon approval of Subcontractors by the Engineer, the Contractor shall, if requested, provide the Owner with complete copies of all subcontracts entered into between the Contractor and any Subcontractor. Providing requested subcontracts to the Owner shall be a condition precedent to the Owner's obligation to make any progress payment to the Contractor.

3.04.9(5) Incorporation of Contract

Every subcontract entered into by the Contractor shall expressly bind each Subcontractor to all of the terms and conditions of the Contract, which the Contractor shall incorporate into each subcontract by reference. The Contractor shall provide a copy of the Contract to all Subcontractors and obtain written confirmation from Subcontractors that the Subcontractor received a copy of the Contract. All Subcontractors shall provide a copy of the Contract to all lower tier Subcontractors and obtain written confirmation from lower tier Subcontractors that the lower tier Subcontractor received a copy of the Contract.

3.04.9(6) Replacement of Subcontractors

Subject to the requirements of state and/or federal agencies having jurisdiction over MBE/WBE/DBE requirements applicable to the Work, should it become impossible for a Subcontractor to perform the Subcontractor's intended work, the Contractor shall submit the information required above for an alternate Subcontractor at least 10 days prior to the time that the Subcontractor is scheduled to begin work. The failure of any Subcontractor to perform its portion of the Work in a timely or workmanlike fashion is the sole responsibility of the Contractor.

3.04.10 MUTUAL RESPONSIBILITY OF CONTRACTORS

The Owner reserves the right to perform other work on or near the Work site using its own forces and/or other contractors. The Contractor shall take all reasonable steps to coordinate its performance of the Work with the Owner and/or such other contractors and Subcontractors. If, through acts of commission or omission on the part of the Contractor, any other contractor or any Subcontractor shall suffer loss or damage with respect to the other work being performed by the Owner, the Contractor agrees to promptly settle with such other Contractor or Subcontractor by agreement or other dispute resolution process. The Contractor agrees to indemnify and hold harmless the Owner and the Engineer from all claims asserted against and liability incurred by the Owner or the Engineer resulting from disputes between the Contractor and any other contractor or any Subcontractor or material supplier. The indemnification rights of the Owner and the Engineer include expenses such as, but not limited to, salaries/wages of employees and all other expenses relating to any mediation, litigation, or arbitration, including costs, consulting fees and attorneys' fees. If such other Contractor or Subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained by an act or omission of the Contractor or anyone for whose acts it may be liable, the Owner or the Engineer shall notify the Contractor, which shall defend, indemnify and save harmless the Owner and the Engineer against such claim.

The coordination of the Work with other work by the Owner shall be taken into account by the Contractor as part of its site investigation obligations under Section 2.01.4, and all costs thereof shall be borne by the Contractor as part of the Contract price for the Work.

3.04.11 RISK OF LOSS

The Contractor shall have all risk of loss for all Work in progress, all materials, all equipment and all other items in any way relating to the Work through theft, fire, other casualty, act of God, or any other cause until the Contract Completion Date.

3.04.12 MEASUREMENT AND PAYMENT

3.04.12(1) **General**

The Contract price for the Work, whether lump sum or unit prices, shall constitute full compensation for furnishing all facilities, labor, materials, appurtenances, and incidentals and performing all operations necessary to construct and complete all items of the Work in accordance with the Contract, notwithstanding that minor or incidental features of the Work may not be shown on the Contract Plans or Contract Provisions.

3.04.12(2) Measurement

Measurement for all items shall be as specified in the Contract for unit price and lump sum price items.

3.04.12(3) Payment

Payment for all of the Work will be made at the lump sum or unit Contract price as set forth in the Contract. Payment of the Contract price shall constitute full compensation for the complete performance of all of the Work.

3.04.12(4) Access to Books and Records

The Contractor shall, whenever so requested, give the Owner and/or the Engineer access to all invoices, bills of lading and other documents relating to the Work. The Contractor shall, without charge, provide personnel and measures and scales with adequate capacity for measuring or weighing any materials or other items paid for on a unit price basis.

3.04.12(5) Progress Payment Estimates

Progress payment estimates shall be prepared by the Engineer and reviewed by the Contractor and will be submitted with the Engineer's recommendation to the Owner for its approval on the first day of the month for all Work completed through the 26th day of the preceding month, unless otherwise agreed upon by the Owner, the Engineer and the Contractor. The Engineer will prepare progress payment estimates as accurately as available information permits. The Owner will make no payment under the Contract for the Work performed until the "Statement of Intent to Pay Prevailing Wages," in accordance with RCW 39.12.040, is submitted to the Engineer, including Subcontractor wage rates. In general, each progress payment will be based upon the payment schedule and the value of Work performed during the preceding pay period. Before the final progress payment estimate is prepared, all quantities will be reviewed by the Engineer.

3.04.12(6) Payment for Materials on Hand

The Owner may reimburse the Contractor for 90 percent of the invoice amount of materials and equipment purchased before their incorporation into the Work if properly stored on or near the Work site. Invoices for equipment and materials will be verified and approved by the Engineer. Each invoice shall be sufficiently detailed to enable the Engineer to determine actual costs. Payment for materials on hand shall not exceed the total Contract cost of the Contract item. Payment will not be made for granular materials, forming materials, consumables, nails, tie wire, etc. Payment will not be made for materials for any invoice that is less than \$2,000.00 or for freight bills and similar items. Payment for equipment or materials on hand shall not constitute acceptance of the equipment or materials. Equipment and materials will be rejected if found to be faulty, even if payment for it has been made.

3.04.12(7) Payments Withheld

The Engineer may decide not to recommend approval of all or a portion of a progress estimate, and/or the Owner may decide to withhold from a progress estimate an amount sufficient to protect the Owner from loss because of:

- a. Defective Work not remedied;
- b. Third-party claims or reasonable evidence indicating the probability that a third-party claim will be asserted;
- c. Failure of the Contractor to make timely and proper payments to Subcontractors or for labor, materials or equipment;
- d. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract price;
- e. Damage to the Owner or another contractor;
- f. Reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance of the Contract price will not be adequate to cover actual or liquidated damages for the anticipated delay;
- g. Repeated failure by the Contractor to comply with the directions of the Owner or the Engineer or to carry out the Work in accordance with the Contract;
- h. Other appropriate reasons necessary to protect the Owner.

3.04.12(8) Payment Upon Correction of Deficiencies

When the reason or reasons for withholding payment are resolved, payment will be made for amounts previously withheld.

3.04.12(9) Final Payment

After final inspection (Section 3.04.16(2)) of the Work and a determination by the Engineer that the Physical Completion Date has been achieved, the balance of the Contract price due to the Contractor will be paid based upon the final estimate by the Engineer and presentation of a Final Contract Voucher Certification signed by the Contractor. The Final Contract Voucher Certification shall be deemed to be a release of all claims of the Contractor unless a claim is filed in accordance with the requirements of Section 3.05 and is expressly excepted from release in the Contractor's Final Contract Voucher Certification. The date the Owner signs the Final Contract Voucher Certification constitutes the Contract Completion Date in accordance with Section 3.04.16(3).

If the Contractor fails, refuses, or is unable to sign and return the Final Contract Voucher Certification or any other documentation required in order to achieve the Contract Completion Date, the Owner reserves the right to establish a completion date (for the purpose of meeting the requirements of RCW 39.08 and RCW 60.28) and unilaterally accept the Work. Unilateral final acceptance will occur only after the Contractor has been provided the opportunity, by written request from the Engineer, to voluntarily submit such documents. If voluntary compliance is not achieved, formal notification of the impending establishment of a completion date and unilateral final acceptance will be provided by certified letter from the Owner to the Contractor, which will provide 30 calendar days for the Contractor to submit the necessary documents. The 30 calendar day period will begin on the date the certified letter is received by the Contractor. The date on which the Owner unilaterally signs the Final Contract Voucher Certification shall constitute the Contract Completion Date under Section 3.04.16(3). The Owner shall have the right to unilaterally establish a Contract Completion Date when either (1) the Physical Completion Date for the Work has been achieved in accordance with Section 3.04.16(2), or (2) the Owner terminates the contract in accordance with Section 3.07. Unilateral establishment of the Contract Completion Date by the Owner shall not in any way relieve the Contractor of any liability for failing to comply with the Contract or from responsibility for compliance with all federal, state, tribal, or local laws, ordinances, and regulations that affect the Work.

Payment to the Contractor of partial or final payment estimates and retained percentages shall be subject to applicable laws.

3.04.13 WORK HOURS

Except in the case of emergency or unless otherwise approved by the Owner, the normal straight time working hours for the Contract shall be any consecutive 8-hour period between 7:00 a.m. and 6:00 p.m. of a working day with a maximum 1-hour lunch break and a 5-day work week. The normal straight time 8-hour working period for the Contract shall be established at the preconstruction conference or prior to the Contractor commencing the Work.

Written permission from the Engineer is required, if a Contractor desires to perform Work on holidays, Saturdays, or Sundays; before 7:00 a.m. or after 6:00 p.m. on any day; or longer than an 8-hour period on any day. The Contractor shall apply in writing to the Engineer for such permission, no later than noon on the working day prior to the day for which the Contractor is requesting permission to work.

Permission to work between the hours of 10:00 p.m. and 7:00 a.m. during weekdays and between the hours of 10:00 p.m. and 9:00 a.m. on weekends or holidays may also be subject to noise control requirements. Approval to continue work during these hours may be revoked at any time the Contractor exceeds the Owner's noise control regulations or complaints are received from the public or adjoining property owners regarding the noise from the Contractor's operations. The Contractor shall have no claim for damages or delays should such permission be revoked for these reasons.

Permission to work Saturdays, Sundays, holidays, or other than the agreed upon normal straight time working hours Monday through Friday may be given subject to certain other conditions set forth by the Owner or Engineer. These conditions may include but are not limited to:

- The Engineer may require designated representatives to be present during the Work. Representatives who may be deemed necessary by the Engineer include, but are not limited to: survey crews; personnel from the Owner's material testing lab; inspectors; and other Owner employees when in the opinion of the Engineer, such Work necessitates their presence.
- Requiring the Contractor to reimburse the Owner all the costs in excess of straight time costs for the Owner's representatives who work during such times. These costs shall be deducted from amounts due or to become due to the Contractor.
- Considering the Work performed on Saturdays, Sundays, and holidays as working days with regard to the Contract Time.
- Considering multiple work shifts as multiple working days with respect to Contract Time, even though the multiple shifts occur in a single 24-hour period.

3.04.14 CONTRACT TIME

The Contract Time shall begin on the first working day following the 10th calendar day after the issuance of the written Notice to Proceed or the first day on which the Contractor begins to perform Work on the site, whichever occurs first. Time is of the essence of the Contract. All of the Work shall be completed within the time limits set forth in the Contract, and the Contractor's unexcused failure to do so shall result in the assessment of liquidated damages as provided in the Contract.

The Contractor shall complete all of the physical Work within the number of working days that are specified as the Contract Time. Every day will be counted as a working day unless it is a non-working day or the Engineer determines the day to be an unworkable day. A non-working day is a Saturday, a Sunday, a day on which the Contract suspends work, or one of the following holidays: January 1st; the third Monday of January; the third Monday of February; Memorial Day; June 19th; July 4th; Labor Day; November 11th; Thanksgiving Day; the day after Thanksgiving; and Christmas Day. Whenever any of these holidays falls on a Sunday, the following Monday shall be counted a non-working day. When the holiday falls on a Saturday, the preceding Friday shall be counted a non-working day.

The days between December 25^{th} and January 1^{st} will be classified as nonworking days, provided that the Contractor actually suspends performance of the Work.

An unworkable day is defined as a partial or whole day that the Engineer determines to be unworkable because of weather, conditions caused by the weather, or such other conditions beyond the control of the Contractor that prevent the satisfactory and timely performance of the Work, and such performance, if not hindered, would have otherwise progressed toward physical completion of the Work.

Each working day shall be charged to the Contract Time as it occurs until the Work is physically complete. If requested by the Contractor in writing, the Engineer will provide the Contractor with a weekly statement that shows the number of working days: (1) charged to the Contract Time the week before; (2) specified for the substantial and physical completion of the Contract Time; and (3) remaining to achieve the substantial and physical completion of the Contract. The statement will also show the nonworking days and any partial or whole days that the Engineer declares to be unworkable. If the Contractor disagrees with any statement issued by the Engineer, the Contractor shall submit a written protest within 10 calendar days after the date of the statement. The protest shall be sufficiently detailed to enable the Engineer to ascertain the basis for the dispute and amount of time disputed. Any statement that is not protested by the Contractor as required in this Section shall be deemed as having been accepted as correct. If the Contractor elects to work 10 hours a day 4 days a week (a 4-10 schedule), the fifth day of that week will be charged as a working day if that day would be chargeable as a working day if the Contractor had not elected to utilize a 4-10 schedule.

3.04.15 CONSTRUCTION SCHEDULE

3.04.15(1) Progress Schedule

- a. The Contractor shall submit to the Engineer four copies of a progress schedule no later than at the preconstruction conference, or some other mutually agreed upon submittal time. The schedule shall be a critical path method (CPM) schedule, bar chart, or other standard schedule format unless otherwise specified in the Technical Specifications. Regardless of which format is used, the schedule shall identify the critical path. The Engineer will evaluate the schedule and return the schedule for corrections. No progress payments will be made until the required progress schedules have been submitted in a form acceptable to the Engineer.
- b. Scheduling terms and practices shall conform to the standards established in Construction Planning and Scheduling, Second Edition, published by the Associated General Contractors of America. Except for Weekly Look-Ahead Schedules, all schedules shall meet these general requirements, and provide the following information:
 - i. Show the construction start date.
 - ii. Include all activities necessary to physically complete the Work on the project.
 - iii. Show the planned order of Work activities in a logical sequence.
 - iv. Show the durations of Work activities in working days as defined in Section 3.04.13 and 3.04.14.
 - v. Show activities in durations that are reasonable for the intended Work.

- vi. Define activity duration in sufficient detail to evaluate the progress of individual activities on a daily basis.
- vii. Show the Substantial and Physical Completion of all Work within the Contract Time.

Total float belongs to the project and shall not be for the exclusive benefit of any party. If the Engineer determines that the Progress Schedule or any necessary Schedule Update does not provide the required information, then the schedule will be returned to the Contractor for correction and resubmittal.

- c. Each week the Work is performed, the Contractor shall submit a Weekly Look-Ahead Schedule showing the Contractor's and all the Subcontractors' proposed Work activities for the next two weeks. The Weekly Look Ahead Schedule shall include the description, duration and sequence of Work, along with the planned hours of Work. This schedule may be network schedule, bar chart, or other standard schedule format. The Weekly Look-Ahead Schedule shall be submitted to the Engineer by the mid-point of the week preceding the scheduled Work or some other mutually agreed upon submittal time.
- d. The Engineer may request a Schedule Update when any of the following events occur:
 - i. The project has experienced a change that affects the critical path.
 - ii. The sequence of Work is changed from that in the approved schedule.
 - iii. The project is significantly delayed.
 - iv. Upon receiving an extension of Contract Time.

The Contractor shall submit four copies of the Schedule Update within 15 calendar days of receiving a written request, or when an update is required by any other portion of the Contract. A "significant" delay in time is defined as 10 working days or 10 percent of the original Contract Time, whichever is greater.

In addition to the other requirements in this Section, Schedule Updates shall reflect the following information:

- v. The actual duration and sequence of as-constructed Work activities, including changed Work.
- vi. Approved time extensions.
- vii. Any construction delays or other conditions that affect the progress of the Work.

- viii. Any modifications to the as-planned sequence or duration of remaining activities.
- ix. The Substantial and Physical Completion of all remaining Work in the remaining Contract Time.

Unresolved request for time extensions shall be reflected in the Schedule Update by assuming no time extension will be granted, and by showing the effects to follow-on activities necessary to substantially and physically complete the project within the currently authorized time for completion.

- e. The original Progress Schedule and all Schedule Updates shall not conflict with any time and order-of-work requirement in the Contract.
- f. If the Engineer deems that the original or any necessary supplemental progress schedule does not provide the information required in this section, the Owner may withhold progress payments until a schedule containing the required information has been submitted by the Contractor and accepted by the Engineer.
- g. The Contractor shall comply with other progress schedule requirements that are further defined in the Technical Specifications.
- h. The Engineer's approval of any schedule shall not transfer any of the Contractor's responsibilities to the Owner. The Contractor alone shall remain responsible for adjusting forces, equipment, and work schedules to ensure completion of the Work within the time(s) specified in the Contract.

3.04.15(2) Extensions of the Contract Time

- a. The Contractor specifically waives claims for damages for any hindrance or delay, excepting unreasonable delays caused by the Owner. In lieu thereof, the Contractor will be granted equitable extensions of the Contract Time for which liquidated damages will not otherwise be claimed by the Owner under the following circumstances:
 - i. A delay caused by any suit or other legal action against the Owner will entitle the Contractor to an equivalent extension of time, unless the period of such delay exceeds 90 calendar days. When such period is exceeded, the Owner will, upon written request of the Contractor, either negotiate a termination of the Contract or grant a further extension of the Contract Time, whichever is in the best interests of the Owner.
 - ii. Should any other unforeseen condition occur that is beyond the reasonable control of Contractor, requires more time for the Contractor to complete the performance of the Work by the Substantial Completion Date, the Contractor shall notify the Owner and the Engineer in writing prior to the performance of such Work, and in any event within 10 calendar days after

the occurrence of the unforeseen condition. The notice shall set forth in detail the Contractor's estimate of the required time extension. The Owner will allow such equitable extension of the Contract Time that the Engineer determines to be appropriate. Failure to comply with the notice provisions required by the Contract shall be deemed a complete waiver of any entitlement to adjustment of the Contract Time.

3.04.15(3) Liquidated Damages

- a. The Contractor acknowledges that the Owner will suffer monetary damages in the event of an unexcused delay in the Substantial Completion Date and the Physical Completion Date of the Work. If the Contractor fails, without excuse under the Contract, to complete the Work within the Contract Time, or any proper extension thereof granted by the Owner, the Contractor agrees to pay to the Owner the amount specified in the Proposal form, not as a penalty, but as liquidated damages for such breach of the Contract, for each day that the Contractor shall be in default after the time stipulated for the Substantial Completion Date and the Physical Completion Date of the Work.
- b. The amount of liquidated damages is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is specifically agreed to be a reasonable approximation of damages that the Owner would sustain as a result of an unexcused delay in the Substantial Completion Date and the Physical Completion Date; said amount may be retained from time to time by the Owner from current progress payments.

3.04.16 COMPLETION AND ACCEPTANCE OF THE WORK

3.04.16(1) Substantial Completion Date

- a. When the Contractor considers the Work to be substantially complete and ready for its intended purpose, the Contractor shall notify the Engineer in writing and include an itemized list of remaining Work to be completed. On the Substantial Completion Date, the Owner shall have full and unrestricted use and benefit of all of the facilities that comprise the Work, both from an operational and safety standpoint, with only minor incidental work, replacement of temporary substitute facilities, or correction or repair of work remaining for the physical completion of the total Work.
- b. If the Engineer determines that the Work is not substantially complete, it will so notify the Contractor in writing identifying those items of the Work that shall be completed by the Contractor in order to achieve the Substantial Completion Date.
- c. If the Engineer believes that the Work is substantially complete, the Engineer will meet with the Contractor to: (1) prepare a list of incomplete or unsatisfactory items of the Work that shall be completed or corrected; (2) define the division of

responsibility between Owner and Contractor with respect to security, operation, maintenance, heat, utilities, insurance, etc., for the facilities; and (3) describe any other issues related to approval of the substantially completed Work. Upon reaching agreement with the Contractor, the Engineer will notify the Owner that, in its opinion and based on the information supplied by the Contractor, the Work is substantially complete, listing the items of incomplete Work, defining the division of responsibilities for the facilities, and setting forth any other terms related to final completion and acceptance.

- d. The Owner, who has sole authority to make the determination of the Substantial Completion Date, will review the Engineer's recommendation that the Work is substantially complete and, if it concurs, will instruct the Engineer to notify the Contractor that the Work is accepted as being substantially complete. Except for any portion(s) of Work specified for early completion or required by the Owner for early possession, substantial completion will not occur for any portion of the Work until the entire Work is ready for possession and use. The approval notice will include a list of incomplete Work items, establish the Substantial Completion Date, and describe any other terms relating to such approval. The Contractor shall acknowledge receipt of the approval notice in writing, indicating acceptance of all of its terms and provisions.
- e. The date of Substantial Completion, as determined by the Engineer and agreed to by the Owner, shall be the date for the beginning of the warranty period.
- f. Subsequent to the Substantial Completion Date, the Owner may exclude the Contractor from the Work during such periods when construction activities might interfere with the operation of the project. The Owner, however, shall allow the Contractor reasonable access for completion of incomplete punch list items.

3.04.16(2) Physical Completion Date

- a. The Contractor shall complete all physical Work within the Contract Time.
- b. Upon physical completion of the Work, including completion of all corrective Work described in Section 3.04.16(1) above and the submission of all required record drawings, operation and maintenance manuals, manufacturers' affidavits, software and programming, and other items required by the Contract, the Contractor shall notify the Engineer in writing that the Work is physically complete. Upon receipt of the notification, the Engineer will determine if the Work is physically complete in accordance with the Contract. If the Engineer determines that any materials, equipment, or workmanship do not meet the requirements of the Contract, the Engineer will prepare a list of such items and submit it to the Contractor. Following the satisfactory completion of the corrective Work by the Contractor, the Engineer will notify the Owner that the Work is physically complete in accordance with the requirements of the Contract.

c. The Engineer, with the concurrence of the Owner, will give the Contractor written notice of the Physical Completion Date for all of the Work. The Physical Completion Date shall not constitute the Owner's acceptance of the Work.

3.04.16(3) Contract Completion Date (Acceptance of the Project)

- a. When all of the Contractor's obligations under the Contract have been performed satisfactorily, the Owner will provide the Contractor with written notice of the Contract Completion Date. The following events shall occur in order for the Contractor to achieve the Contract Completion Date:
 - 1. The Contractor shall have achieved the Substantial Completion Date and the Physical Completion Date for the Work; and
 - 2. The Contractor shall furnish all documentation required by the Contract and required by law. The documents shall include, but are not limited to, the following:
 - i. Complete and legally effective releases and/or waivers of liens or bond or retainage claims in a form acceptable to the Owner. Subject to prior approval of the Owner, the Contractor may, if approved by the Owner, submit in lieu of the lien or claims releases and waivers: (1) receipts showing payment of all accounts in full; (2) an affidavit that the release and receipts cover all labor, services, materials, and equipment for which a lien or other claim could be filed and that all payrolls, material, and equipment bills and other indebtedness connected with the Work for which the Owner or the Owner's property might in any way be responsible, have been paid; and (3) the consent of the surety, if any, to final payment. If any Subcontractor or supplier fails to furnish a release waiver or receipt in a form satisfactory to the Owner, the Contractor may be permitted by the Owner to furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any lien or similar claim;
 - ii. Certified Payrolls (Federal Aid projects or if requested);
 - iii. Final Contract Voucher Certification.
 - iv. Affidavits of Wages Paid for the Contractor and all Subcontractors must be submitted to the Owner.
- b. The Contractor agrees that neither completion nor final acceptance shall relieve the Contractor of the responsibility to indemnify, defend, and protect the Owner against any claim or loss resulting from the failure of the Contractor (or the Subcontractors or lower tier Subcontractors) to pay all laborers, mechanics, Subcontractors, materialpersons, or any other person who provides labor, supplies, or provisions for carrying out the Work or for any payments required for unemployment

compensation under Title 50 RCW or for industrial insurance and medical aid required under Title 51 RCW.

Final acceptance shall not constitute acceptance of any unauthorized or defective work or material. The Owner shall not be barred from requiring the Contractor to remove, replace, repair, or dispose of any unauthorized or defective work or material or from recovering damages for any such work or material.

3.04.16(4) <u>Use of Completed Portions of the Work</u>

The Owner reserves the right to use and occupy any portion of the Work which has been completed sufficiently to permit partial use and occupancy, and such partial use and occupancy shall not be construed as an acceptance of the Work as a whole or any part thereof. Any claims that the Owner may have against the Contractor shall not be deemed to have been waived by such partial use and occupancy.

3.04.16(5) Waiver of Claims by Contractor

The Contractor's acceptance of the final payment from the Owner constitutes an irrevocable and complete waiver of any and all claims against the Owner under the Contract or otherwise arising from the Work, except for those claims that have been properly identified in writing in advance of final payment, and for which timely and sufficient prior written notice has been given, all in accordance with the Contract.

3.04.17 CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT

The Owner's final payment to the Contractor shall not relieve the Contractor of responsibility for faulty materials, equipment or workmanship. The Contractor shall promptly repair or replace any such defects discovered within the warranty or other applicable limitations period.

3.04.18 RETAINAGE

- 1. Pursuant to RCW 60.28, there will be retained from monies earned by the Contractor on progress estimates a sum not to exceed 5 percent of the monies earned by the Contractor. Such retainage shall be used as a trust fund for the protection and payment (1) to the State with respect to taxes imposed pursuant to RCW Title 82, which may be due from such Contractor, and (2) the claims of any other person or entity arising under the Contract or RCW 60.28.
- 2. Monies retained pursuant to RCW 60.28 shall, at the option of the Contractor, be:
 - a. Retained in a fund by the Owner;
 - b. Deposited by the Owner in an interest-bearing account in a bank, mutual savings bank, or savings and loan association (interest on monies so retained may be paid to the Contractor);

- c. Deposited by the Owner in an escrow (interest-bearing) account in a bank, mutual saving bank, or savings and loan association (interest on monies so retained shall be paid to the Contractor). Deposits are to be in the name of the Owner and are not to be allowed to be withdrawn without the Owner's written authorization. The Owner will issue a check representing the sum of the monies reserved, payable to the bank or trust company;
- d. In choosing option (b) or (c), the Contractor agrees to assume full responsibility to pay all costs which may accrue from escrow services, brokerage charges or both, and further agrees to assume all risks in connection with the investment of the retainage in securities.

At the time the Contract is executed the Contractor shall designate the option desired.

- 3. Release of retainage will be made within the statutory period following the last date for filing of claims pursuant to RCW Chapter 60.28, provided that the following conditions are met:
 - a. A release has been obtained from the Washington State Department of Revenue;
 - b. A "Certificate of Payment of Contributions Penalties and Interest on Public Works Contract" is received from the Washington State Employment Security Department;
 - c. The Washington State Department of Labor and Industries indicates the Contractor is current on the payment of industrial insurance and medical aid premiums;
 - d. All claims by the Owner against the Contractor have been resolved;
 - e. No claims have been filed against the retained percentage;
 - f. All required "Affidavits of Wages Paid" are on file with the Owner for the Contractor and all Subcontractors, regardless of tier;
- 4. In the event that claims are filed against the retainage, the Contractor will be paid the retained percentage less an amount sufficient to pay all such claims, together with a sum determined by the Owner to be sufficient to pay the costs of foreclosing on claims and to attorneys' fees, all in accordance with applicable law.

3.05 DISPUTES AND CLAIMS

3.05.1 DISPUTES

When disputes occur, the Contractor shall pursue resolution through the Engineer. The Contractor shall follow the notice and protest procedures outlined in Section 3.04. If negotiation using the procedures outlined in Section 3.04 fails to provide satisfactory resolution, the Contractor shall pursue the more formalized method set forth in Section 3.05.2 for submitting claims.

3.05.2 CLAIMS

If the Contractor contends that additional payment is due, has provided timely notices and protests as required by Section 3.04, and the Contractor has pursued and exhausted all of the means provided in that section to resolve the dispute, the Contractor may submit a claim as provided in this Section. Any claim for an increase in the Contract price or for an extension of the Contract Time by the Contractor is waived if the written notifications and protests required in Section 3.04 have been not provided, or if the Engineer is not afforded reasonable access to the Contractor's complete records relating to the claim, as required by Section 3.04.8, or if a claim is not submitted in accordance with the requirements of this Section. The fact that the Contractor has provided proper notification, properly submitted a claim, or provided the Engineer with access to records, shall not in any way be construed as proving or substantiating the validity of the claim. If, after consideration by the Owner, the claim is found to have merit, the Owner will make an equitable adjustment to either the Contract price, the Contract Time, or both. If the Owner finds the claim to be without merit, no adjustment will be made.

All claims submitted by the Contractor shall be in writing and in sufficient detail to enable the Engineer to ascertain the basis for and amount of the claim. All claims shall be submitted to the Engineer in the manner in Section 3.03.6. The following information shall accompany each claim submitted:

- 1. A detailed factual statement of the basis for the claim for additional compensation and/or extension of time, including all relevant dates, locations, and items of work relating to the claim.
- 2. The date on which the events occurred that give rise to the claim.
- 3. The name of each person involved in or having knowledge about the claim.
- 4. The specific provisions of the Contract which support the claim and a statement of the reasons why such provisions support the claim.
- 5. If the claim relates to a decision of the Engineer that the Contract leaves to the Engineer's discretion or as to which the Contract provides that the Engineer's decision is final, the Contractor shall set out in detail all facts supporting its position relating to the decision of the Engineer.

- 6. The identification of any documents and the substance of any oral communications that support the claim.
- 7. Copies of any identified documents, other than Owner documents and documents previously furnished to the Owner by the Contractor, that support the claim (manuals which are standard to the industry may be included by reference).
- 8. If an extension of the Contract Time is sought:
 - a. The specific days and dates for which the extension is sought;
 - b. The specific reasons why the Contractor believes a time extension should be granted;
 - c. The specific provisions of Section 3.04.15(2) under which the time extension is sought; and
 - d. An analysis of the Contractor's progress schedule, demonstrating the reasons why a time extension should be granted.
- 9. If additional compensation is sought, the exact amount sought and a breakdown of that amount into the following categories:
 - a. Labor;
 - b. Materials;
 - c. Direct equipment. The actual cost for each piece of equipment for which a claim is made, or, in the absence of actual cost, the rates established by the AGC/WSDOT Equipment Rental Agreement which was in effect when the Work was performed. The amounts claimed for any piece of equipment shall not exceed the rates established by the Equipment Rental Agreement, even if the actual cost for such equipment is higher. The Owner may audit the Contractor's cost records, as provided in Section 3.06, to determine actual equipment costs. The following information shall be provided for each piece of equipment:
 - i. Detailed description (e.g., make, model, year, diesel or gas, size of bucket);
 - ii. The hours of use or standby; and
 - iii. The specific day and dates of use or standby.
 - d. Subcontractor claims (in the same level of detail as specified herein); and
 - e. Other information as requested by the Engineer or the Owner.

(name)	(title)	
of		
(cor	mpany)	
herein for work on	the claim for extra compensation and time, if a this Contract is a true statement of the acught, and is fully documented and supported e parties.	tual costs
Subcontractor or low agent of the Contract basis for the Subcon- determined that all su money and/or time re- back-up documentati	ra time and/or compensation involves any ver tier Subcontractor, the undersigned duly a tor hereby swears that Contractor has investigated as or lower tier Subcontractor's claim uch claims are justified as to entitlement and a equested, has reviewed and verified the adequion and has no reason to believe and does not for the Subcontractor's or lower tier Subco	outhorized igated the is and has amount of all ot believe
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claim is falsely repre		
claim is falsely repre	esented.	

A notarized statement containing the following language:

It will be the responsibility of the Contractor to keep full and complete records of the costs and additional time incurred with respect to any claim. The Contractor shall permit the Engineer to have access to those records and any other records and documents as may be required by the Engineer to determine the facts or contentions involved in the claim. The Contractor shall retain all records and documents in any way relating to the Work for a period of not less than three years after the Contract Completion Date.

The Contractor shall in good faith attempt to reach a negotiated resolution of all claims with the Engineer or its designee.

10.

The Contractor's failure to submit with the Final Contract Voucher Certification a list of all claims, together with the information and details required by this Section shall operate as a waiver of the claims by the Contractor, as provided in Section 3.04.12(9).

If the Contractor submits a claim in full compliance with all the requirements of this Section, the Owner will respond in writing to the claim as follows:

- 1. Within 45 calendar days from the date the claim is received by the Owner, if the claim amount is less than \$100,000;
- 2. Within 90 calendar days from the date the claim is received by the Owner, if the claim amount is equal to or greater than \$100,000; or
- 3. If these time periods are unreasonable due to the complexity of the claim, the Contractor will be notified within 15 calendar days from the date the claim is received by the Owner of the amount of time which will be necessary for the Owner to evaluate the claim and issue a response.

Full compliance by the Contractor with the provisions of this Section is a condition precedent to the Contractor's right to commence a lawsuit or pursue other legal remedies.

3.05.3 TIMELINE AND JURISDICTION

For the convenience of the parties to the Contract it is mutually agreed by the parties that any claims or causes of action which the Contractor has against the Owner arising from the Contract shall be brought within 180 calendar days from the date of Physical Completion (Section 3.04.16(2)) of the Contract by the Owner; and it is further agreed that any such claims or causes of action shall be brought only in the Superior Court of the county where the Owner headquarters is located, provided that where an action is asserted against a county, RCW 36.01.050 shall control venue and jurisdiction. The parties understand and agree that the Contractor's failure to bring suit within the time period provided, shall be a complete bar to any such claims or causes of action. It is further mutually agreed by the parties that when any claims or causes of action which the Contractor asserts against the Owner arising from the Contract are filed with the Owner or initiated in court, the Contractor shall permit the Owner to have timely access to any records deemed necessary by the Owner to assist in evaluating the claims or action.

3.05.4 CONTINUATION OF WORK PENDING RESOLUTION OF DISPUTES

The Contractor shall expeditiously carry on the Work, adhere to the progress schedule, and comply with all written directives of the Owner or the Engineer regardless of any dispute or claim that may exist between the Owner and the Contractor. No Work shall be delayed or postponed pending resolution of any dispute or claim. Failure or refusal of the Contractor to comply with the written directives of the Owner or the Engineer shall constitute a material breach of the Contract and immediately constitute grounds for the Owner to withhold payments to the Contractor, suspend

the Work or terminate the Contract. Notice under this Section shall be in accordance with other provisions of the Contract.

3.06 AUDITS

If the Contractor requests an equitable adjustment to either the Contract price or the Contract Time, the Owner shall have the right to audit the Contractor's books, records, other documents, and accounting practices and procedures, and to inspect the Contractor's plant, equipment and facilities to examine all facts and verify all direct and indirect costs of whatever nature claimed to have been incurred or are anticipated to be incurred. The right to audit encompasses all subcontracts and is binding upon Subcontractors. All subcontracts that the Contractor enters into shall contain a clause allowing the Owner to audit all Subcontractor books, records, other documents, and accounting practices and procedures, and to inspect the Subcontractor's plant, equipment and facilities. All audits shall be performed by auditors of the Owner during normal working hours at the Contractor's or Subcontractor's office or any other location mutually agreed upon. The Contractor, Subcontractor, or lower tier Subcontractor shall cooperate fully with the auditor and shall make available all required information. Failure to cooperate or provide requested information shall be grounds for denial of the claim.

3.07 SUSPENSION OF WORK AND TERMINATION OF CONTRACT

3.07.1 SUSPENSION OF WORK

- 1. The Owner or the Engineer may order suspension of all or any part of the Work if:
 - a. Unsuitable or other conditions that are beyond the reasonable control of the Contractor exist or arise that prevent satisfactory and timely performance of the Work; or
 - b. The Contractor does not comply with the Contract; or
 - c. It is in the public interest.
- 2. If the Engineer determines that the suspension is for reasons set forth in Subsection a. or c. above, an equitable adjustment will be made in the Contract Time but not the Contract price. If the Engineer determines that the suspension is for reasons set forth in Subsection b. above, no adjustment shall be made in the Contract Time or the Contract price.
- 3. If the Contract is suspended for reasons set forth in Subsection a. or c. above and the Contractor believes that the suspension of performance of all or part of the Work has continued for an unreasonable period of time, the Contractor shall give written notice to the Engineer of its intention to seek an equitable adjustment in the Contract Time or the Contract price. In the event that an equitable adjustment is allowed, no adjustment shall be allowed for any time lost or costs incurred more than 10 calendar days before delivery of the written notice to the Engineer. No profit of any kind will be allowed on any increase in costs due to the suspension,

delay or interruption.

3.07.2 TERMINATION FOR DEFAULT

- 1. The Owner may terminate the Contract for default, effective seven days following delivery of written notice of default to the Contractor, if the Contractor:
 - a. Refuses or fails to supply enough properly skilled laborers or conforming materials to complete the Work in a timely manner;
 - b. Refuses or fails to prosecute the Work with such diligence as will ensure its physical completion by the Physical Completion Date;
 - c. Performs work which deviates from the requirements of the Contract and refuses or fails to correct the non-conforming work;
 - d. Fails to make prompt payment to Subcontractors and/or suppliers for labor or materials;
 - e. Fails to comply with laws, ordinances, rules, regulations or orders of a public authority having jurisdiction; or
 - f. Otherwise fails to follow written directives of the Owner or the Engineer or is in default of a material provision of the Contract.
- 2. If the Contractor abandons the Work for any cause other than failure of the Owner to make monthly progress payments for Work properly performed, or if the Contractor refuses to comply with requirements of the Contract, the Owner has the additional right to notify the Contractor's performance bond surety and require the surety to complete the Work in accordance with the Contract.

3.07.3 TERMINATION FOR CONVENIENCE OF THE OWNER

The Owner may by written notice terminate the Contract at any time in whole or in part, without cause, and except where termination is due to the Contractor's default, the Owner shall pay the Contractor that portion of the Contract price corresponding to the acceptable Work completed to the Owner's satisfaction, together with reasonable costs, as determined in the sole discretion of the Owner, necessarily incurred by the Contractor in terminating the remaining portion of Work, less any payments made before termination. In no event shall the Owner be required to pay the Contractor any amount in excess of the completed portion Contract price. The Owner shall not be required to pay the Contractor any amount for consequential damages including but not by means of limitation lost or anticipated profits on Work that is not performed as a result of termination.

3.07.4 RESPONSIBILITY OF THE CONTRACTOR AND SURETY

Termination of the Contract shall not relieve the Contractor of any responsibilities under the Contract for Work performed. Nor shall termination of the Contract relieve the sureties of their obligations under the bonds required or permitted by the Contract or applicable law.

PART 4 TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

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DIVISION 1 GENERAL TECHNICAL REQUIREMENTS

SECTION 01110

SUMMARY OF WORK

PART 1 GENERAL

1.1 SCOPE OF WORK

The work specified in this Section consists of furnishing all labor, materials, and equipment necessary for construction of the Manzanita Reservoir and Booster Pump Station, as shown on the Plans. Work shall include, but not be limited to, the following:

A. SCHEDULE A: MANZANITA RESERVOIR AND BOOSTER PUMP STATION

- 1. Complete required erosion control, clearing, grubbing, excavation, grading, backfill, and compaction.
- 2. Demolish existing house foundation structure on site and coordinate with the Fire Department for burning of house.
- 3. Demolish and decommission existing septic tank and drain field.
- 4. Construct stormwater pond.
- 5. Construct two (2) 200,000-gallon concrete reservoir and associated piping.
- 6. Construct wood framed booster station building.
- 7. Furnish and install package booster pump.
- 8. Furnish and install 2,560 LF 6-inch water main.
- 9. Furnish and install piping, valves, and appurtenances.
- 10. Furnish and install all required HVAC equipment.
- 11. Furnish and install emergency propane generator and propane tank.
- 12. Furnish and install all required electrical, telemetry, and instrumentation.

- 13. Provide testing, commissioning, and training as specified herein.
- 14. Demolish Highland Park existing reservoir and salvage booster station facilities.
- 15. Furnish and install site fence and gate.
- 16. Restore all surface disturbed by construction activities.

B. SCHEDULE B: MANZANITA TO ALDERBROOK WATER MAIN

- 1. Complete required erosion control, clearing, grubbing, excavation, grading, backfill, and compaction.
- 2. Furnish and install 2,795 LF 8-inch water main.
- 3. Restore all surface disturbed by construction activities.

1.2 PROJECT INFORMATION

The Contract Documents show the location, arrangement, and type of work to be performed under the proposed project.

The Contractor shall be responsible for proper notification to and coordination with all utility districts, service districts, and all other persons and services that will be affected by this project at least one week in advance of beginning any construction that affects them. The existing booster station and reservoir facilities shall remain functional throughout the construction of the new facilities and shall only be decommissioned/demolished following completion of, startup, and acceptance of the new facilities.

It is the intent and purpose of these Contract Documents to have constructed complete facilities in good working order for the least practical cost to the Owner. Suggestions, recommendations, as well as inquiries from the Contractor that will serve this purpose are welcome and will be given consideration by the Owner and the Engineer.

1.3 CONTRACTOR USE OF SITE AND PREMISES

Construction operations shall be limited to the areas noted on the Plans and subject to the approval of the Engineer.

The Contractor shall submit a traffic control plan for all site access and egress routes for construction vehicle traffic per Section 01950.

The Contractor shall allow representatives of the Owner, funding, and regulatory agencies access to the project site at all times.

The Contractor shall notify the Owner (or other water utility purveyor) at least 48 hours in advance of any proposed water system shut downs. The Contractor shall also be responsible for notifying all impacted water users 48 hours in advance of any water shutoff.

1.4 ORDER OF WORK

The order of work will be at the option of the Contractor, except as noted below, in keeping with good construction practice, time restrictions, requirements of the permits applicable to this project, and the order of work as outlined herein, all costs of which shall be included in the various bid amounts. The Contractor shall conduct the order of work to allow the existing facilities to remain operational during the construction of the Project and shall coordinate all of their activities through the Engineer with the Owner's operations and maintenance staff. The Contractor shall provide a written plan of activities to the Engineer and Owner each Thursday for the following week, for review and coordination with existing facility operations.

The implementation of any measure required to protect the environment shall supersede any order of work designated within these Specifications. The Contractor shall meet the conditions as outlined in any and all permits and requirements of the Federal, State, County, and City regulatory agencies.

The Contractor shall keep the disruption of the existing facility operations to a minimum. Water system shutdowns shall be limited to 8 hours during any 24-hour period. The existing booster station and reservoir facilities shall remain functional throughout the construction of the new facilities and shall only be decommissioned/demolished following completion of, startup, and acceptance of the new facilities.

Access to the existing operations areas shall be maintained. Disruption of this access shall be kept to a minimum and must be prearranged and scheduled through the Engineer with the Owner's operations and maintenance staff.

The following summary shall be used as a general guideline of the construction tasks to be performed. The tasks are generally listed in the order of completion. The tasks, however, can be completed in a different order than listed herein, including performance of two or more tasks concurrently. The Contractor shall prepare a complete project schedule, which shall be provided in accordance with the limitations specified herein.

- 1. Install erosion control and sediment control devices.
- 2. Coordinate with Fire Department for them burning house.
- 3. Demolish existing structures and decommission septic tank and drain field
- 4. Complete sitework and piping.
- 5. Construct new reservoirs and booster pump station.
- 6. Disinfect, flush, test, and commission new reservoirs and booster pump station.
- 7. Complete startup, commissioning and training.
- 8. Decommission and demolish existing reservoir and booster station.
- 9. Complete restoration.

The access off Mcreavy Road shall be maintained at all times. Work at the electrical substation by another Contractor will occur during this project.

*** END OF SECTION ***

SECTION 01150

SURVEYS

PART 1 GENERAL

1.1 SCOPE

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

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

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

1.2 **DEFINITIONS**

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

1.3 RELATED WORK SPECIFIED ELSEWHERE

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

1.4 **OUALIFICATIONS**

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

1.5 SUBMITTALS

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

Mason County PUD No. 1 Manzanita Reservoir and Booster Pump Station G&O #22260 01150-1 - Surveys

1.6 QUALITY ASSURANCE

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

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

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

- Piles
- Shafts
- Footings
- Columns

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

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

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

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

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

For monuments to be removed or destroyed as shown on the Plans, the Contractor's PLS shall file all required permit forms with the Department of Natural Resources (DNR), as required by RCW 58.09.130 and WAC 332-120. The form "Application for Permit to Remove or Destroy a Survey Monument" shall be signed by the PLS, and submitted directly to DNR and the Owner. No work affecting monumentation shall commence until DNR has approved the permit. The form "Completion Report for Monument Removal or Destruction" shall be signed by the PLS and submitted to DNR and the Owner upon completion of work affecting monumentation.

The Contractor shall be responsible for locating and preserving existing monuments within the right-of-way, which shall include existing property corners on the right-of-way lines. In the event the Contractor disturbs or destroys any survey marker, monument, or property corner during the course of construction, not indicated to be removed on the Plans, the Contractor shall bear all costs or survey, resetting, legal claims and filing state forms as required by RCW 58.09.130 and WAC 332-120.

*** END OF SECTION ***

SECTION 01160

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section contains information pertaining to permits and licenses, and use of private property.

1.2 PERMITS AND LICENSES

Except as noted below, the Contractor shall be responsible for obtaining and paying all fees associated with all the necessary permits, licenses, approvals, and construction permits necessary for the execution of this Contract, whether they be City, County, State, or Federal permits.

The Owner is in possession of, or will be responsible for obtaining the following approvals and permits, and will pay the fees associated with the application and procurement of such approvals and permits. The Contractor is advised to become familiar with these approvals and permits as necessary for this project. The Contractor shall comply with all conditions of each approval/permit as if the conditions were detailed herein. Copies of these permits are required to be onsite at all times.

- A. Washington State Department of Health Project Approval.
- B. Mason County Land Modification Permit (Issued, picked up by Owner).
- C. Mason County Demolition Permit (Issued, picked up by Owner).
- D. Mason County Building Permit Booster Station Building (Issued, picked up by Owner).
- E. Mason County Building Permit Reservoirs (Issued, picked up by Owner).

1.3 USE OF PRIVATE PROPERTY

The Contractor shall be responsible for all conditions of any arrangements the Contractor makes for the use of any privately owned property.

In the event any dispute occurs and claims for damages are filed by the property owners, the Owner will request that the Contractor give evidence that they have requested their insurance company to make personal contact with the claimants. Any settlement for insurance claims shall be strictly an act restricted to the claimant, the Contractor, and their insurance company.

The Contractor is advised that in the event of any property damage, the Owner reserves the right to withhold monies to protect the property owner.

1.4 PROPERTY RELEASE FORM

The Contractor shall be held responsible for acquiring signed property release forms, in the format provided on the following page, for all properties that have been disturbed or damaged by the Contractor's operations, or utilized by the Contractor for staging, storing, or stock piling of materials or equipment.

This work shall include submitting the form(s), as further shown herein, by certified mail to each property owner effected and further including therein a self-addressed stamped envelope for the property owner's use. The enclosed self-addressed envelope shall be addressed to: Mason County PUD No. 1, 21971 North Highway 101, Shelton, WA 98584. Contractor shall provide evidence of all certified mailings.

*** END OF SECTION ***

PROPERTY RELEASE

	(Property Address)
DATE:	
(P	roperty Owner's Name), owner of
Ac	, hereby release
(C	ontractor's Name) , from any property
damage or per	rsonal injury resulting from construction adjacent
to or on my p	roperty located at,
during constru	(Property Address) action of the Manzanita Reservoir and Booster Pump Station.
	below is my acknowledgment and acceptance that my property, as identified turned to a satisfactory condition.
	Name:
	Signed:
	Address:
	Phone:

*** END OF SECTION ***

SECTION 01200

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SCOPE

This Section further defines Measurement and Payment for this project.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
GC Section 3.04.12	Measurement and Payment
01300	Submittals

1.3 MEASUREMENT

Measurement for all items shall be as indicated in these Specifications for unit price and lump sum price bid items. Bid items are outlined in detail in this Specification Section and listed in the Proposal.

Measurement shall be in accordance with Section 1-09.1 of the WSDOT Standard Specifications. Volumes of gravel materials and concrete volumes shall be measured by the Engineer in the field and quantities will be limited to the relative neat line dimensions shown on the Plans or as approved by the Engineer in the field.

Weighing equipment, scale verification checks, load tickets for quarry spalls, rock riprap, cobbles, gravel materials, hot mix asphalt, bituminous construction materials, etc., shall conform to Section 1-09.2 of the WSDOT Standard Specifications. Load tickets shall include all gravel materials, cast-in-place concrete, cement grout, CDF, hot mix asphalt, ATB, and reinforcing steel. The Owner will pay for no material received by weight unless they have been weighed as required in this Section or as required by another method the Engineer has approved in writing. All costs incidental to weighing shall be merged into the various unit prices bid.

1.4 INDIVIDUAL BID ITEMS

The following is a list of bid items for the project. The contract price for each item constitutes full compensation for furnishing all equipment, labor, materials, appurtenances, and incidentals and performing all operations necessary to construct and complete the various bid items in accordance with the Contract

Documents. Payment for each item shall be considered as full compensation, notwithstanding that minor features may not be mentioned herein. Work paid for under one item will not be paid for under any other item. If a particular item of work shown on the Plans or described in Specifications is not described in a specific bid item, this item of work shall be considered as incidental to the work and the costs for this work shall be merged into the various respective unit price and lump sum bid items.

SCHEDULE A: MANZANITA RESERVOIR AND BOOSTER PUMP STATION

- 1. Mobilization and Demobilization
 - a. Measurement: Will be measured by lump sum.
 - b. Payment: The lump sum contract price for MOBILIZATION AND DEMOBILIZATION shall include all costs for the labor, materials, and equipment required for mobilization and demobilization on the project as described in Section 01505.

Payment for MOBILIZATION AND DEMOBILIZATION shall be as follows:

50% Payment: When Contractor has mobilized on-site

and temporary facilities are in place.

75% Payment: When 50 percent of the total pay items are

completed (not including payment for

materials on hand).

100% Payment: When Project is completed and

recommended for acceptance.

This item shall also include costs for all labor, material, and equipment to provide temporary traffic control for the project as specified in Section 01950.

2. Minor Change

- a. Measurement: Will be negotiated prior to commencing any such work under this pay item and shall be for work to remedy unforeseen conditions, utility conflicts, minor landscaping, minor drainage improvements, or special surface restoration.
- b. Payment: Payment or credits for changes amounting to \$20,000 or less may be made under the Bid Item MINOR CHANGE. At the discretion of the Owner, this procedure for Minor Changes may be used in lieu of the more formal procedure as outlined in General Conditions Section 3.04.6. The Contractor will be provided a copy of the completed order for Minor Changes. The agreement for the Minor Changes will be documented by signature of the Contractor or notation of the verbal agreement. If the Contractor is in disagreement with anything required by the order for Minor Changes, the Contractor may protest the order as provided in General Conditions Section 3.04.8.

Payments or credits will be determined in accordance with General Conditions Section 3.04.6. All Minor Change work will be within the scope of the Contract Work and will not change Contract Time. For the purpose of providing a common Proposal for all Bidders, the Owner has entered an amount for MINOR CHANGE in the Proposal to become part of the total Bid by the Contractor.

3. Demolition

- a. Measurement: Will be measured by lump sum.
- b. Payment: The lump sum contract price for DEMOLITION shall include all costs for labor, materials, and equipment associated with demolition of the existing concrete tank, disconnection and salvage of the existing tank appurtenances and booster station components to the Owner, wastehaul of any non-salvaged material, and demolition of piping, and appurtenances as shown on the Plans and as specified in Section 01900.

- 4. Decommission Septic Tank and Drainfield
 - a. Measurement: Will be measured by lump sum.
 - b. Payment: The lump sum contract price for DECOMMISSION SEPTIC TANK AND DRAINFIELD shall include all costs for labor, materials, and equipment associated with demolition of and decommissioning the existing septic tank and drainfield and appurtenances as shown on the Plans and as specified in Section 01900.
- 5. Project Temporary Traffic Control
 - a. Measurement: Will be measured by lump sum.
 - b. Payment: The lump sum contract price for PROJECT TEMPORARY TRAFFIC CONTROL shall include all costs for labor, materials, and equipment required to provide traffic control as shown on the Plans and as specified in Section 01950.
- 6. Locate Existing Utilities
 - a. Measurement: Will be measured by lump sum.
 - b. Payment: The lump sum contract price for LOCATE EXISTING UTILITIES shall include all costs for labor, materials, and equipment required to pothole and locate existing utilities as shown on the Plans and as specified in Section 02050.
- 7. Clearing and Grubbing
 - a. Measurement: Shall be measured by lump sum.
 - b. Payment: The unit price per lump sum for CLEARING AND GRUBBING which shall include all costs for the labor, materials, and equipment to clear and grub the project site as shown on the Plans and as specified in Section 02230, as well as fees and permits related to disposal.

- 8. Trench Excavation Safety Systems
 - a. Measurement: Will be measured by lump sum.
 - b. Payment: The lump sum contract price for TRENCH EXCAVATION SAFETY SYSTEMS shall include all costs for labor, materials, and equipment required to provide sheeting, shoring, and bracing of trenches and open excavations as required to meet the Washington Industrial Safety and Health Act, Chapter 49.17 RCW and Section 02250. These costs shall not be considered incidental to any other bid item.

9. Erosion Control

- a. Measurement: Shall be measured by lump sum.
- b. Payment: The lump sum contract price for EROSION CONTROL shall include all costs for the labor, material, and equipment for installation and maintenance of all temporary erosion and sediment control measures and best management practices (BMPs), as shown on the Plans and as further described in Section 02370.

10. Unsuitable Excavation

- a. Measurement: Will be measured by the cubic yard, in-place and shall be to the limits as designated by the Engineer. There shall be no payment if the Engineer believes removal of materials is needed because of damage caused by the Contractor's operations.
 - All quantities will be measured and recorded by the Engineer in his Daily Report and the Contractor shall be responsible for reconciling his quantities with the Engineer on a daily basis.
- b. Payment: The unit price per cubic yard for UNSUITABLE EXCAVATION shall include all cost for labor, material, and equipment to excavate and wastehaul unsuitable native subgrade materials.

The Contractor is advised that the excavation of any and all unsuitable material must be authorized by the Engineer in writing prior to the commencement of said excavation by the Contractor.

11. Sitework

- a. Measurement: Shall be measured by lump sum.
- b. Payment: The lump sum contract price for SITEWORK shall include all costs for labor, materials, and equipment to excavate, dewater, wastehaul excess native material to an approved disposal site, and grade and compact site as shown on the Plans and as specified herein.

12. Gravel Borrow

- a. Measurement: Shall be measured per ton, in-place, based on truck tickets and shall be to the limits designated and approved by the Engineer.
- b. Payment: The unit price bid per ton for GRAVEL BORROW shall include all costs for the labor, material, and equipment associated with furnishing, installing, and testing gravel borrow as shown on the Plans and as described in Sections 02300 and 02700. Payment shall be based on the weight of material installed, as approved by the Engineer.

13. Crushed Surfacing Top Course

- a. Measurement: Shall be measured per ton, in-place, based on truck tickets and shall be to the limits designated and approved by the Engineer.
- b. Payment: The unit price bid per ton for CRUSHED SURFACING TOP COURSE shall include all costs for the labor, material, and equipment associated with furnishing, installing, and testing crushed surfacing top course as shown on the Plans and as described in Section 02700. Payment shall be based on the weight of material installed, as approved by the Engineer.

14. Crushed Surfacing Base Course

- a. Measurement: Shall be measured per ton, in-place, based on truck tickets and shall be to the limits designated and approved by the Engineer.
- b. Payment: The unit price bid per ton for CRUSHED SURFACING BASE COURSE shall include all costs for the labor, material, and equipment associated with furnishing, installing, and testing crushed surfacing top course as shown on the Plans and as described in Section 02710. Payment shall be based on the weight of material installed, as approved by the Engineer.

15. Restoration

- a. Measurement: Shall be measured by lump sum.
- b. Payment: The lump sum contract price for RESTORATION shall include all costs for the labor, material, and equipment associated with cleanup, surface restoration, sawcutting, asphalt, pavement markings, quarry spalls, pond seed mix, topsoil, and hydroseeding as shown on Plans and as specified in Section 02900. This shall also include all costs for labor, materials, and equipment to provide complete installation of fencing and gates including but not limited to new concrete footings, posts, bars, tension wire, barbed wire, chain link fabric, and all hardware.

16. 200,000-Gallon Concrete Reservoir and Foundation

- a. Measurement: Shall be measured per each.
- b. Payment: The unit price per each for the 200,000-GALLON CONCRETE RESERVOIR AND FOUNDATION shall constitute full compensation for furnishing, installing, manufacturing, and erecting the 200,000-Gallon Concrete Reservoir and Foundation, foundation, overflow piping, inlet, outlet, drain piping, and appurtenances (under and within the 200,000-Gallon Concrete Reservoir and Foundation), all accessories, appurtenances, dewatering, and testing. The reservoir foundation shall include all concrete and reinforcing steel

necessary for a complete installation in good working order, as shown on the Plans and as specified herein.

17. Booster Station Building

- a. Measurement: Shall be measured by lump sum.
- b. Payment: The lump sum contract price for BOOSTER STATION BUILDING shall include all costs for labor, materials, and equipment to construct the booster station building including, but not limited to, concrete, foundation, wooden structure, beams, wood trusses, roofing, trim siding, doors, insulation, hardware, painting and HVAC as shown on the Plans and as Specified herein.

18. Packaged Booster Station

- a. Measurement: Shall be measured by lump sum.
- b. Payment: The lump sum contract price for PACKAGED BOOSTER STATION shall include all costs for the labor, material, and equipment to furnish, install, test, and commission the packaged booster station as shown on the Plans and as specified in Section 11265.

19. Piping, Valves, and Appurtenances

- a. Measurement: Shall be measured by lump sum.
- b. Payment: The lump sum contract price for PIPING, VALVES, AND APPURTENANCES, shall include all costs for the labor, materials, and equipment to install piping, valves, and appurtenances including, but not limited to trench excavation, dewatering, bedding, backfilling with imported gravel borrow or suitable native material, compaction, connecting to existing system, pipe penetrations, water piping, storm piping, drain piping, fittings, valves, valve boxes, Type 2 catch basins, draft hydrant, sample station pipe supports, thrust blocks, CDF, pea gravel, trash racks, locating tape, copper wire, flexible expansion joints, disinfection and testing as shown on the Plans and as specified herein.

- 20. Emergency Propane Generator and Propane Tank
 - a. Measurement: Shall be measured by lump sum.
 - b. Payment: The lump sum price for EMERGENCY PROPANE GENERATOR AND PROPANE TANK shall include costs for labor, materials, and equipment associated with furnishing and installing a permanent on site emergency generator and propane tank as shown on the Plans and as described in Division 16 of these Specifications.

21. Telephone Service

- a. Measurement: Shall be measured by lump sum.
- b. Payment: The lump sum contract price shall include all costs associated with the modifications to the telephone service provided by Hood Canal Communications. For bidding purposes, an amount of \$10,000 will be included in the proposal for TELEPHONE SERVICE line item. The Owner will pay the actual invoice cost of service modifications completed by Hood Canal Communications. All other costs or coordinating the telephone service modifications shall be included in the bid item for ELECTRICAL, TELEMETRY, AND INSTRUMENTATION.
- 22. Electrical, Telemetry, and Instrumentation
 - a. Measurement: Shall be measured by lump sum.
 - b. Payment: The lump sum price for ELECTRICAL, TELEMETRY, AND INSTRUMENTATION shall include all costs for labor, materials, tools, and equipment to furnish and install electrical, telemetry, and instrumentation components of this Project, including conduit, wiring, grounding, and all other work as shown on the Plans and as described in Divisions 13 and 16 of these Specifications.

23. Apprenticeship Incentive

- a. Measurement: Shall be measured by calculation.
- b. Payment: For the purpose of providing a common Proposal for all bidders, the Contracting Agency has entered an amount in the Proposal for Apprenticeship Incentive to become a part of the total bid by the Contractor. An incentive of \$2,000.00 will be assessed with the Final Payment for Contractors who meet the Apprentice Utilization Requirement without a reduction by Good Faith Effort, as described in Section 3.03.4(3.1) of the Supplementary General Conditions.

Where there are multiple schedules of work containing Apprenticeship Incentive items in the Proposal, the measurement by calculation for each incentive item will be based on the assessment of the entire project as a whole meeting the Apprentice Utilization Requirement without a reduction by Good Faith effort, rather than by schedule of work.

24. Apprenticeship Penalty

- a. Measurement: Shall be measured by calculation. Apprenticeship Hours will be measured for each hour of work performed by an apprentice as shown on the Monthly Apprentice Utilization Report, based on certified payrolls or the affidavits of wages paid, whichever is least. The percentage is not rounded up.
- b. Payment: For the purpose of providing a common Proposal for all bidders, the Contracting Agency has entered an amount in the Proposal for Apprenticeship Penalty to become a part of the total bid by the Contractor, as described in Section 3.03.4(3.1) of the Supplementary General Conditions. When the Contractor fails to meet the Apprenticeship Requirement of 15 percent, a penalty will be assessed for a percentage range of unmet requirement, unless a Good Faith Effort is approved by the Contracting Agency.

Apprenticeship Penalty will be calculated as described below:

Percent of	
Requirement Met	Penalty
>90% to <100%	\$500
>75% to 90%	\$1,000
>50% to 75%	\$1,500
>0% to 50%	\$2,000
0%	\$2,500

Where there are multiple schedules of work containing Apprenticeship Penalty items in the Proposal, the measurement by calculation for each penalty item will be based on the assessment of the entire project as a whole meeting the Apprentice Utilization Requirement without a reduction by Good Faith effort, rather than by schedule of work.

The Contractor shall include all related costs in the unit Bid prices of the Contract, included but not limited to implementing, developing, documenting, and administering an apprenticeship utilization program, recording and reporting hours and all other costs to comply with this provision.

SCHEDULE B: MANZANITA TO ALDERBROOK WATER MAIN

- 1. Mobilization and Demobilization
 - a. Measurement: Will be measured by lump sum.
 - b. Payment: The lump sum contract price for MOBILIZATION AND DEMOBILIZATION shall include all costs for the labor, materials, and equipment required for mobilization and demobilization on the project as described in Section 01505.

Payment for MOBILIZATION AND DEMOBILIZATION shall be as follows:

50% Payment: When Contractor has mobilized on-site and temporary facilities are in place.

75% Payment: When 50 percent of the total pay items are

completed (not including payment for

materials on hand).

100% Payment: When Project is completed and recommended for acceptance.

2. Minor Change

- a. Measurement: Will be negotiated prior to commencing any such work under this pay item and shall be for work to remedy unforeseen conditions, utility conflicts, minor landscaping, minor drainage improvements, or special surface restoration.
- b. Payment: Payment or credits for changes amounting to \$10,000 or less may be made under the Bid Item MINOR CHANGE. At the discretion of the Owner, this procedure for Minor Changes may be used in lieu of the more formal procedure as outlined in General Conditions Section 3.04.6. The Contractor will be provided a copy of the completed order for Minor Changes. The agreement for the Minor Changes will be documented by signature of the Contractor or notation of the verbal agreement. If the Contractor is in disagreement with anything required by the order for Minor Changes, the Contractor may protest the order as provided in General Conditions Section 3.04.8.

Payments or credits will be determined in accordance with General Conditions Section 3.04.6. All Minor Change work will be within the scope of the Contract Work and will not change Contract Time. For the purpose of providing a common Proposal for all Bidders, the Owner has entered an amount for MINOR CHANGE in the Proposal to become part of the total Bid by the Contractor.

3. Project Temporary Traffic Control

a. Measurement: Will be measured by lump sum.

b. Payment: The lump sum contract price for PROJECT TEMPORARY TRAFFIC CONTROL shall include costs for all labor, material, and equipment to provide temporary traffic control for the project as shown on the Plans and as specified in Section 01950.

4. Locate Existing Utilities

- Measurement shall be measured by lump sum. a.
- Payment: The lump sum contract price for LOCATE b. EXISTING UTILITIES shall include all costs for the labor, materials and equipment required to locate existing utilities as shown on the Plans, and meet the requirements of Section 02050, Locate Existing Utilities.
- 5. Trench Excavation Safety Systems
 - a. Measurement: Will be measured by lump sum.
 - Payment: The lump sum contract price for TRENCH b. EXCAVATION SAFETY SYSTEMS shall include all costs for labor, materials, and equipment required to provide sheeting, shoring, and bracing of trenches and open excavations as required to meet the Washington Industrial Safety and Health Act, Chapter 49.17 RCW and Section 02250. These costs shall not be considered incidental to any other bid item.
- 6. Removal of Unsuitable Material (Trench)
 - Measurement: Will be measured by the cubic yard, a. in-place and shall be to the limits as designated by the Engineer. There shall be no payment if the Engineer believes removal of materials is needed because of damage caused by the Contractor's operations.

All quantities will be measured and recorded by the Engineer in his Daily Report and the Contractor shall be responsible for reconciling his quantities with the Engineer on a daily basis.

b. Payment: The unit price per cubic yard for REMOVAL OF UNSUITABLE MATERIAL (TRENCH) shall include all cost for labor, material, and equipment to excavate and wastehaul unsuitable native subgrade materials.

The Contractor is advised that the excavation of any and all unsuitable material must be authorized by the Engineer in writing prior to the commencement of said excavation by the Contractor.

7. Erosion Control

- a. Measurement: Shall be measured by lump sum.
- b. Payment: The lump sum contract price for EROSION CONTROL shall include all costs for the labor, material, and equipment for installation and maintenance of all temporary erosion and sediment control measures and best management practices (BMPs), as shown on the Plans and as further described in Section 02370.
- 8. 8-Inch C900 PVC Water Main (Incl. Bedding)
 - a. Measurement: Shall be measured per linear foot as measured along the ground surface.
 - b. Payment: The unit price per linear foot for 8-INCH C900 PVC WATER MAIN (INCL. BEDDING) shall include all costs for the labor, material, and equipment to install 8-inch waterline. The unit price shall include all costs to install, disinfect, and test complete and in place the 8-inch waterline, including fittings, blocking, joint restraint, locating tape, copper wire, and appurtenances as shown on the Plans and as described in Section 02500 of these Specifications. The unit price shall also include all costs for excavation, dewatering, bedding, backfill with native material (if allowed), compaction, disinfection, and testing.

9. Additional Fittings

a. Measurement: Shall be measured per pound based on the actual weight of the additional fittings alone, excluding follower glands, bolts, gaskets, and blocking.

b. Payment: The unit price bid per pound for ADDITIONAL FITTINGS shall include all costs for the labor, material. and equipment to furnish and install any fittings required in addition to those specifically shown on the Plans and shall include, where appropriate, all costs for follower glands, bolts, fusing, gaskets, thrust blocks, anchor blocks, connect to existing system, excavation, compaction, and any and all other costs of material, equipment, tools, and labor incurred in the installation of the additional fittings.

10. 8-Inch Gate Valves

- Measurement: Shall be measured per each. a.
- b. Payment: The unit price bid per each for 8-INCH GATE VALVES shall include all costs for labor, materials, and equipment to furnish and install the gate valves and appurtenances as shown on the Plans and as described in Section 02500 of these Specifications.

11. Foundation Gravel

- Measurement: Shall be measured per cubic yard and shall a. be to the limits shown on the Plans or as required by encountered subgrade conditions as approved by the Engineer.
- b. Payment: The unit price bid per cubic yard for FOUNDATION GRAVEL shall include all costs for the labor, material, and equipment for furnishing and installing foundation gravel in trenches and below structures as shown on the Plans and as described in Section 02700. The quantity of material for payment shall be based volume of material placed within the neat line limits as shown on the Plans and as approved by the Engineer.

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

12. Gravel Borrow for Trench Backfill

- a. Measurement: Shall be measured by the ton, in-place, based on truck tickets and shall be to the limits designated and approved by the Engineer.
- b. Payment: The unit price bid per ton for GRAVEL BORROW FOR TRENCH BACKFILL shall include all costs for the labor, material, and equipment associated with furnishing, installing, and testing gravel borrow and wastehauling native material as shown on the Plans and as described in Sections 02300 and 02700. Payment shall be based on the weight of material installed, as approved by the Engineer.

13. Crushed Surfacing Top Course

- a. Measurement: Shall be measured per ton, in-place, based on truck tickets and shall be to the limits designated and approved by the Engineer.
- b. Payment: The unit price bid per ton for CRUSHED SURFACING TOP COURSE shall include all costs for the labor, material, and equipment associated with furnishing, installing, and testing crushed surfacing top course as shown on the Plans and as described in Section 02710.

14. Road Repair

- a. Measurement: Shall be measured per lump sum.
- b. Payment: The lump sum contract price for ROAD REPAIR shall include all costs for the labor, materials, and equipment to furnish and install, and test hot mix asphalt, trench gravel borrow and sawcutting as shown on the Plans and described in Section 02740.

15. Quarry Spalls

a. Measurement: Shall be measured per cubic yard and shall be to the limits shown on the Plans.

b. Payment: The unit price bid per cubic yard for QUARRY SPALLS shall include all costs for the labor, material, and equipment for furnishing and installing quarry spalls for ditch trench repair as shown on the Plans and as described in Section 02700.

16. Controlled Density Fill

- a. Measurement: Shall be measured by the cubic yard, in-place and shall be to the limits designed and approved by the Engineer.
- b. Payment: The unit price bid per cubic yard for CONTROLLED DENSITY FILL shall include all costs for labor, material and equipment to furnish and install control density fill as shown on the Plans and as specified in Section 03350.

1.5 PROJECT MATERIALS ON HAND

See General Conditions Section 3.04.12(6).

1.6 PAYMENT

Payment for all work will be made at the contract unit price or lump sum price as indicated in the Proposal, payment of which shall constitute full compensation, for a complete installation.

For items of equipment, acceptable operating and maintenance information shall be delivered to the Engineer before the Contractor will be paid for more than 90 percent of the purchase value of that equipment. Purchase value shall be the net price for the equipment as given on the invoice.

Final operating and maintenance manuals per Section 01300 must be delivered to the Engineer prior to the Project being 90 percent complete. Progress payments for work in excess of 90 percent completion will not be made until the specified acceptable operating and maintenance information has been delivered to the Engineer.

*** END OF SECTION ***

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes requirements that apply to all equipment and materials supplied on the Project.

The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The Contractor shall verify that all features of all products conform to the requirements of the Contract Documents. Submittal documents shall be clearly edited to indicate only those items, models, or series of equipment that are being submitted for review. All extraneous materials shall be crossed out or otherwise obliterated. The Contractor shall ensure that there is no conflict with other submittals and notify the Engineer in each case where their submittal may affect the work of another contractor or the Owner. The Contractor shall ensure coordination of submittals among the related crafts and subcontractors and shall verify such coordination on all submittals.

Where noted in the Contract Documents, the structural, mechanical, and electrical designs associated with the indicated equipment items are specific to the manufacturer and model number specified. Any structural, mechanical, or electrical modifications required to utilize an approved substitution to the specified equipment shall be made by the Contractor at no additional cost to the Owner. Where approved substitutions of specified equipment affect other materials or equipment, mechanical, structural, or electrical work, the Contractor shall note in the equipment submittal any necessary changes to accommodate the substituted equipment. It shall also be the responsibility of the Contractor to coordinate other mechanical, structural, or electrical equipment submittals to make sure that all changes necessary to accommodate the substituted equipment are addressed in these submittals as well. See General Condition 3.04.3.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01720	Record Drawings
01800	Testing, Commissioning, and Training
11000	Equipment General Provisions
Division 16	Electrical

Mason County PUD No. 1

Manzanita Reservoir and Booster Pump Station

1.3 WORK INCLUDED

Submittals required for this work shall include any or all of the following as required by the particular specification section and the submittal schedule:

A. SCHEDULES AND PLANS

B. PRODUCT SUBMITTALS

- 1. Manufacturer's Literature
- 2. Shop Drawings
- 3. Color and Material Samples
- 4. Design Calculations
- 5. Test Reports

C. EQUIPMENT OPERATION AND MAINTENANCE MANUALS

D. RECORD DRAWINGS

1.4 SUBMITTAL INFORMATION

Shop, catalog, and other appropriate drawings and information shall be submitted to the Engineer for review prior to fabrication or ordering of all equipment and materials specified. The number of copies of submittal information to be submitted shall be as indicated below.

All submittal information shall be sent to the Engineer through the Contractor. The Contractor shall assign a separate submittal number to each item or group of items that relate to each specification section. Submittal numbers shall be assigned in consecutive ascending order, with the first project submittal assigned the number "1." Resubmittals shall be numbered using the same number followed by an alphabetical suffix. All submittals shall bear the Contractor's certification that they have reviewed, checked, and approved the submittal information prior to transmitting to the Engineer. The submittal number and related specification section shall be marked on each submittal.

PART 2 PRODUCTS

2.1 GENERAL

When the Contract Documents require a submittal, the Contractor shall submit the information electronically in .pdf format. One reviewed .pdf copy of the submittal

will be returned to the Contractor. Two hard copies and one electronic pdf copy of final Equipment Manuals must be submitted.

Electronic submittals shall be provided in tabbable, searchable, pdf format and should include a table of contents bookmarked to provide a navigation link to each section of the submittal. Information should be clear and legible. Information pertaining to the specific materials proposed for use on the project shall be highlighted.

2.2 PRODUCT SUBMITTALS

A. GENERAL

When indicated in the Contract Documents, the Contractor shall submit product data for review by the Engineer. Unless otherwise specified, within 10 calendar days after receipt of the submittal, the Engineer shall review the submittal and return three copies of the marked-up submittal. The reproducible original will be retained by the Engineer. The returned submittal shall indicate one of the following actions:

- 1. If the review indicates that the material, equipment, or work method complies with the project Specifications, submittal copies will be marked "NO EXCEPTIONS TAKEN." In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.
- 2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED." The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in operation and maintenance data, a corrected copy shall be provided.
- 3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "AMEND AND RESUBMIT." Except at their own risk, the Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."
- 4. If the review indicates that the material, equipment, or work method does not comply with the project Specifications, copies of the submittal will be marked "REJECTED SEE REMARKS."

Submittals with deviations that have not been identified clearly may be rejected. Except at their own risk, the Contractor shall not undertake the work covered by such submittals until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

B. MANUFACTURER'S LITERATURE

Where the contents of submitted literature include data not pertinent to the submittal, the portion(s) of the contents being submitted for the Engineer's review shall be clearly indicated.

C. SHOP DRAWINGS

Shop drawings shall be submitted in the form of blue-line or black-line prints of each sheet. Blueprint submittals will not be acceptable.

All shop drawings shall be accurately drawn to a scale sufficiently large enough to show pertinent features and method of connection or joining. On all shop drawings, figure dimensions shall be used as opposed to scaled dimensions.

D. COLOR AND MATERIAL SAMPLES

All material samples shall be of the exact article proposed to be furnished for the work and shall be submitted in the quantity required. Samples shall be returned to the Contractor, with one retained by the Engineer.

Unless the precise color is specifically described in the Contract Documents, or whenever a choice of color or pattern is available in a specified product, accurate color charts shall be submitted to the Engineer for their review and selection.

E. DESIGN CALCULATIONS

Where required in the Specifications, design calculations shall be submitted to the Engineer. Design calculations shall be complete, concise, and in an easy-to-read format. All design calculations shall be stamped by a Professional Engineer licensed in the State of Washington.

F. TEST REPORTS

Copies of all test reports shall be submitted to the Engineer.

2.3 EQUIPMENT MANUALS

A. GENERAL

For all items of equipment, manufacturer's equipment operation and maintenance manuals shall be submitted to the Engineer for review. One copy will be returned to the Contractor with comments.

The following information shall be furnished for all items of equipment installed on the project requiring operational and/or maintenance procedures, and for any additional items indicated by the Engineer.

1. Lubrication Information

This shall consist of the manufacturer's recommendations regarding the lubricants to be used and the lubrication schedule to be followed.

2. Electrical and Control Diagrams

Diagrams shall show internal and connection wiring.

3. Startup Procedures

These instructions consist of equipment manufacturer's recommendations for installation, adjustment, calibration, and troubleshooting.

4. Operating Procedures

These instructions consist of the equipment manufacturer's recommended step-by-step procedures for starting, operating, and stopping the equipment under specified modes of operation.

5. Preventive Maintenance Procedures

These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the equipment.

6. Overhaul Instructions

These instructions consist of the manufacturer's directions for the disassembly, repair, and reassembly of the equipment and any

safety precautions that must be observed while performing the work.

7. Parts List

This list consists of the generic title and identification number of each component part of the equipment.

8. Spare Parts List

This list consists of the manufacturer's recommendations of number of parts, which should be stored by the Owner and any special storage precautions, which may be required.

9. Exploded View

Exploded or cut views of equipment shall be provided if available as a standard item of the manufacturer's information. When exploded or cut views are not available, plan and section views shall be provided with detailed callouts.

10. Test Documentation

Reports, records, data and forms documenting the results of equipment factory tests, including pump and blower performance curves, shall be provided, with the operating points for the specific equipment designated. When a special factory test of the supplied equipment is not performed, the manufacturer's standard performance reports and curves, with specified operating points, shall be provided for the supplied equipment.

11. Specific Information

Where items of information not included in the above list are required, they will be provided as described in the specifications for the equipment.

12. Warranty Information

13. Maintenance Information Summaries

In addition, the following items of equipment shall be provided with Maintenance Information Summaries in each appropriate section of the equipment manuals, prepared according to the format specified herein:

- Heating and Ventilation Equipment
- Valves (larger than 1-inch in size)
- Booster Pumps
- Emergency Propane Generator and Propane Tank
- Plant Instrumentation, Telemetry and Control Equipment
- Electrical Equipment

Maintenance information summaries shall be prepared on 8-1/2-inch x 11-inch paper only and shall contain the following information compiled from manufacturer's recommendations in the order shown.

- 1. Description or name of item of equipment.
- Manufacturer.
- 3. Name, address, and telephone number of local manufacturer's representative.
- 4. Serial number (where applicable). The Contractor shall verify that it matches the equipment installed on the project.
- 5. Equipment nameplate data including model number.
- 6. Recommended maintenance procedures:
 - a. Description of procedures.
 - b. Maintenance frequency required.
 - c. Lubricant(s) or other materials required (where applicable), including type of lubricant, lubricant manufacturer, and specific compound.
 - d. Additional information as required for proper maintenance.

7. Recommended spare parts.

The maintenance information summary shall be placed at the beginning of the manual.

All operation and maintenance information shall be comprehensive and detailed, and shall contain information adequately covering all normal operation and maintenance procedures.

For ease of identification, each manufacturer's brochure and manual shall be appropriately labeled with the equipment name and equipment specification number as it appears in the project Specifications. The information shall be organized in binders. The binders shall be provided with a table of contents and tab sheets to permit easy location of desired information.

Lubricants shall be described in detail, including type, recommended manufacturer, and manufacturer's specific compound to be used.

It shall be the responsibility of the Contractor to ensure that all operation and maintenance materials are obtained. Material submitted must meet the approval of the Engineer prior to project acceptance.

B. EXTRANEOUS DATA

Where the contents of the manuals include manufacturers' standard brochures or catalog pages, the exact item(s) used in this installation shall be clearly indicated and all manufacturers' data which is extraneous shall be clearly deleted.

C. FINAL EQUIPMENT MANUALS

The Contractor shall be responsible for tracking and coordinating each separate manufacturer's equipment operation and maintenance manual submittal and shall resubmit, as necessary, until the Engineer's review indicates that the submittal is acceptable. The Contractor shall maintain equipment manual files until final approval copies are delivered to the Engineer. The Contractor shall be responsible for collating the approved operation and maintenance submittal sections into complete final manufacturers' equipment operation and maintenance manuals bound in post binders which are indexed to the Specifications. The Contractor shall deliver the complete final operation and maintenance manuals to the Engineer prior to project completion. All copies final manufacturers' equipment manuals submitted will be retained by the Engineer or Owner.

The Contractor shall also supply three CD-Rom or USB copies of the final equipment manuals in a tabbed, searchable, .pdf format, with a table of contents bookmarked to provide a navigation link to each section of the manual.

PART 3 EXECUTION

3.1 IDENTIFICATION OF SUBMITTALS

A. GENERAL

Each submittal shall be accompanied by a letter of transmittal showing the date of transmittal, specification section, or drawing number to which the submittal pertains, submittal number, and a brief description of the material submitted.

B. RESUBMITTALS

When material is resubmitted for any reason, it shall be submitted under a new letter of transmittal and referenced to the previous submittal.

3.2 REVIEW OF SUBMITTALS

The Engineer will review all submittals for general conformance with the design and other requirements of the Contract Documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the Contract Documents. Submittals may be rejected based on inadequate information and/or not meeting the requirements of the Contract Documents. Rejection of submittals requires action on the part of the Contractor to correct the reason for the rejection. The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, and for techniques of assembly and installation.

3.3 COORDINATION OF PRODUCT SUBMITTALS

A. GENERAL

Prior to submittal for review by the Engineer, all data shall be fully coordinated, including the following:

- 1. All field dimensions and conditions.
- 2. All trades and public agencies involved, including necessary approvals.
- 3. All deviations from the Contract Documents.

B. GROUPING OF SUBMITTALS

- 1. All submittals shall be grouped with associated items, unless otherwise specifically permitted by the Engineer.
- 2. The Engineer may reject the submittals in their entirety or any part thereof, if not in accordance with the Contract Documents.

C. CERTIFICATION

Submittals shall bear the Contractor's certification that they have reviewed, checked, and approved the shop drawings prior to forwarding them to the Engineer.

3.4 TIMING OF PRODUCT SUBMITTALS

A. GENERAL

- 1. All submittals shall be made far enough in advance of installation to provide all required time for reviews and securing necessary approvals.
- 2. In scheduling, the Contractor shall allow for the time indicated in Part 2.2A for the Engineer's review following their receipt of the submittal.

B. DELAYS

No additional or separate payment will be made for costs of delays occasioned by tardiness of submittals on the part of the Contractor.

3.5 EQUIPMENT MANUALS

The preliminary copies of the manufacturer's equipment manuals shall be delivered to the Engineer for review not later than the time of equipment delivery to the project site.

Final copies of the manufacturer's equipment manuals shall be delivered to the Engineer at least 14 calendar days prior to requesting payment in excess of 90 percent completion for the project. Prior to submittal of the final equipment manuals, the Contractor shall check the manuals for accuracy and completeness and shall verify that prior review comments have been addressed.

PROJECT MEETINGS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes information pertaining to the various meetings that will be held during the course of constructing this project.

1.2 PRECONSTRUCTION CONFERENCE

As soon as possible following the award of the Contract, a preconstruction conference shall be scheduled for representatives of the Owner, the Contractor, the Engineer, funding agencies, regulatory agencies, and affected utilities.

1.3 PROJECT PROGRESS MEETINGS

The Owner and the Engineer will schedule and attend regular weekly meetings with the Contractor for coordination, administrative, and procedural requirements of the project. The Contractor shall provide a meeting room with table and chairs at or near the site for project progress meetings. At the discretion of the Owner, project meetings may be held virtually.

1.4 CONSTRUCTION MEETINGS

The Contractor shall schedule and hold regular meetings during the project:

- A. Safety Meetings (Contractor's subcontractors shall attend if they are working onsite.)
- B. Project Progress Meetings
- C. Equipment Installation Meetings
- D. Coordination Meetings
- E. Startup and Testing Meetings

The Contractor shall notify the Owner and Engineer in advance of all meetings. The meetings may or may not be attended by the Owner and Engineer.

QUALITY CONTROL

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
02300	Earthwork
02700	Gravel Materials
02710	Gravel Surfacing
03300	Reinforced Concrete

1.3 PAYMENT

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

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

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

PART 2 PRODUCTS

2.1 GENERAL

The Contractor shall be responsible for all material testing specified in the Contract Documents and any applicable permits and codes. The materials testing laboratory shall be accredited for performing the various testing methods either by AASHTO R18, AASHTO 150/IEC 17025 or the American Association for

Laboratory Accreditation and further approved by the Owner. The materials testing laboratory shall send test results directly to the Engineer.

2.2 EARTHWORK AND GRANULAR MATERIALS

A. COMPACTION CONTROL

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

ASTM D1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort

B. IN-PLACE TESTS

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

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

2.3 AGGREGATES

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

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

2.4 CAST-IN-PLACE CONCRETE

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

PART 3 EXECUTION

3.1 SAMPLING AND TESTING FREQUENCY

A. GENERAL

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

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

B. SOIL TESTING

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

<u>Material</u>	<u>Test</u>	Minimum Sampling & <u>Testing Frequency</u>
Backfill for foundations, walls, trenches and roads	Gradation ¹	One every 500 cy or one per day for quantities exceeding 25 cy. For trenches, one every 750 feet of trench.
	In-Place Density ^{2,3,4}	One every 500 cy or one per day for each type of soil or fill material with quantities exceeding 25 cy. For trenches, one per day and one every 250 feet of trench.
	Moisture-Density Relationship ³	One prior to start of backfilling operation, one every 20 densities and any time material type changes.
Pipe Bedding	Gradation ¹	One every 750 feet of trench.
Subgrade and Fills	In-Place Density ^{2,3}	One every 500 cy of each type material.
	Moisture-Density Relationship	One for every 20 densities for each material.
	Gradation	One for every moisture-density.

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

C. CONCRETE TESTING

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

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

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

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

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

<u>Material</u>	<u>Test</u>	Minimum Sampling & <u>Testing Frequency</u>
Coarse Aggregate (for each grading size) ¹	Gradation	One test every 500 cy of concrete.
	Deleterious Substances	One test initially and thereafter when appearance makes the material suspect.
	L.A. Abrasion	One every 2,000 tons of aggregate.
	Moisture specific gravity and absorption ¹	One initially and every 250 cy thereafter. One moisture to be conducted prior to any batching and more frequently if hauling and storage does not provide a consistent moisture content.
Fine Aggregate ¹	Gradation and fineness modules	One every 250 cy of concrete.
	Deleterious Substances	(same as coarse aggregate).
	Moisture, specific gravity and absorption ¹	(same as coarse aggregate).
Concrete	Slump	Conduct one test every day of placement and one additional test for every 50 cy placed and more frequently if batching appears inconsistent. Conduct in conjunction with taking concrete cylinders.
	Entrained Air	Conduct with each slump test.

<u>Material</u>	<u>Test</u>	Minimum Sampling & <u>Testing Frequency</u>
	Ambient and concrete temperatures	Conduct with each slump test.
Concrete	Compressive strength and evaluation of results per ACI 214. (includes unit weight of each cylinder)	For all concrete placement, take one set of four cylinders per day and one additional set of cylinders for every 50 cy of each class of structural concrete. Cylinders shall be 4 inch by 8 inch. Test one cylinder at 7 days and two at 28 days. Fourth cylinder shall be held in reserve. A plot and statistical evaluation shall be maintained in accordance with ACI 214 for compressive strength results. Field cure cylinders shall be made when insitu strengths are required to be known.

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

D. SPECIAL INSPECTIONS

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

TEMPORARY FACILITIES

PART 1 GENERAL

1.1 SCOPE

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

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

1.1 RELATED WORK SPECIFIED ELSEWHERE

Section Item

01505 Mobilization and Demobilization

PART 2 PRODUCTS

2.1 UTILITIES

A. TEMPORARY ELECTRICITY

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

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

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

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

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

B. WATER

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

2.2 SANITARY FACILITIES

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

2.3 OFF-SITE STAGING AND PARKING

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

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

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

2.4 ENCLOSURES

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

PART 3 EXECUTION

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

MOBILIZATION AND DEMOBILIZATION

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of mobilization and demobilization. Mobilization consists of preconstruction activities and preparatory work for the project necessary to mobilize labor, materials, and equipment to the project site. Demobilization consists of activities to remove materials and equipment from the project site upon project completion, including final cleanup. Items which are not considered mobilization or demobilization include but are not limited to:

- A. On-going activities throughout the duration of construction.
- B. Profit, interest on borrowed money, overhead, or management costs.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section Item

Division 1 General Technical Requirements

PART 2 PRODUCTS

Products and materials required for mobilization and demobilization are described in the various sections of Division 1 and in other parts of the Contract Documents.

PART 3 EXECUTION

Complete mobilization and demobilization as required by the various sections of Division 1 and other parts of the Contract Documents.

RECORD DRAWINGS

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 1300 Item Submittals

1.3 INFORMATION PROVIDED BY THE OWNER

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

A. One full size paper set of Plans.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 GENERAL

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

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

Unless otherwise specified, record drawings shall be full size and maintained in a clean, dry, and legible condition. Record documents shall not be used for construction purposes and shall be available for review by the Engineer during

normal working hours at the Contractor's field office. At the completion of the work, prior to final payment, all record drawings shall be submitted to the Engineer.

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

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

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

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

CLEANUP

PART 1 GENERAL

1.1 SCOPE

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

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

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

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

1.3 QUALITY ASSURANCE

A. INSPECTION

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

B. CODES AND STANDARDS

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

PART 2 PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

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

2.2 COMPATIBILITY

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

PART 3 EXECUTION

3.1 PROGRESS CLEANING

A. GENERAL

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

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

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

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

B. SITE

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

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

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

C. STRUCTURES

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

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

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

D. STREETS

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

3.2 FINAL CLEANING

A. DEFINITION

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

B. GENERAL

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

C. STRUCTURES

1. Exterior

Visually inspect all exterior surfaces and remove all traces of soil, waste, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Engineer may require light sandblasting or other cleaning at no additional cost to the Owner.

2. Interior

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

3. Glass

Clean all glass inside and outside.

D. TIMING

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

TESTING, COMMISSIONING, AND TRAINING

PART 1 GENERAL

1.1 SCOPE

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

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01110	Scope of Work
01300	Submittals
01400	Quality Control
01500	Temporary Facilities
15050	Piping Systems
15400	Plumbing
15700	HVAC
16050	Basic Electrical Materials and Methods

1.3 QUALITY ASSURANCE

A. INSTALLATION

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

B. TESTING

1. General Requirements

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

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

Tests and inspection shall include:

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

Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry. The Contractor shall see that scheduling and performance of all tests are coordinated with involved subcontractors and suppliers. The Contractor shall allow for up to two additional setpoint

changes during testing. No extra costs or time allowances shall be provided as long as this setpoint allowance is not exceeded.

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

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

2. Delivery Acceptance Tests and Inspections

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

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

quality of workmanship, the Contractor shall provide the necessary documentation or conduct such tests deemed necessary by the Engineer to demonstrate compliance.

3. Installed Tests and Inspections

General

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

b. Procedures

i. General

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

ii. Pre-operation Checkout

The installed tests and inspection procedures shall incorporate all requirements of these Specifications and shall proceed in a logical, step-wise sequence to ensure that all equipment has been properly

serviced, aligned, connected, calibrated, and adjusted prior to operation. Preoperation checkout procedures shall include, but not necessarily be limited to:

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

iii. Water Test

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

If under test, any portion of the work should fail to fulfill the Contract requirements and is adjusted, altered, renewed or replaced, tests on that portion when so adjusted, altered, removed or replaced, together with all other portions of the work as are affected thereby, shall, if so required by the Engineer, be repeated within reasonable time and in accordance with the specified conditions. The Contractor shall pay to the Owner all reasonable expenses incurred by the Owner as a result of repeating such tests.

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

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

repeat tests as may be necessary to achieve the Contract requirements shall be conducted by the Contractor at their expense.

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

4. Operational Testing

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

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

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

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

5. Commissioning

After completion of the operational testing and certifications by the Engineer that the systems meet all performance requirements, commissioning will begin. The commissioning period for all systems shall be 5 days. The Owner's operations and maintenance personnel will be responsible for operation of the facility or portion of the facility during this period of time. The facility or portion thereof shall be fully and continuously operational, accepting all normal flow called for in design and performing all functions as designed.

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

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

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

C. **TRAINING**

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

1.4 **SUBMITTALS**

STARTUP AND TESTING PLAN A.

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

B. TRAINING OUTLINE

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

PART 2 PRODUCTS

2.1 INSTALLATION

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

2.2 **TESTING**

A. GAUGES, METERS, RECORDERS, AND MONITORS

Gauges, meters, recorders, and monitors shall be provided by the Contractor as required to supplement or augment the instrumentation

Mason County PUD No. 1

Manzanita Reservoir and Booster Pump Station

system provided under this Contract to properly demonstrate that all equipment fully satisfies the requirements of the Specifications. All devices employed for the purpose of measuring the performance of the facility's equipment and systems shall be specifically selected to be consistent with the variables to be monitored. All instruments shall be recently calibrated, and the Contractor shall be prepared at all times to demonstrate, through recalibration, the accuracy of all instruments employed for testing purposes. Calibration procedures shall be in accordance with applicable standards of ASTM, ISA, and IEEE. The adequacy of all gauges, meters, recorders and monitors shall be subject to review by the Engineer.

В. **RECORDS**

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

C. TEMPORARY TEST FACLITIES AND MODIFICATIONS

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

PART 3 EXECUTION

3.1 **INSTALLATION**

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

3.2 TESTING

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

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

3.3 TRAINING

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

GENERAL OUTLINE FOR MANUFACTURER PRESENTATIONS

A. FAMILIARIZATION

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

B. SAFETY

- 1. Point out safety references.
- 2. Discuss proper precautions around equipment.

C. OPERATION

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

D. PREVENTIVE MAINTENANCE (PM)

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

E. CORRECTIVE MAINTENANCE

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

F. PARTS

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

G. LOCAL REPRESENTATIVES

- 1. Where to order parts: Name, address, telephone, fax, e-mail.
- 2. Service problems:
 - a. Who to call.
 - b. How to get emergency help.

SALVAGE AND DEMOLITION

PART 1 GENERAL

1.1 SCOPE

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

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

1.2 SALVAGE

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

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

1.3 DEMOLITION

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

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

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

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

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

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

TRAFFIC CONTROL

PART 1 GENERAL

1.1 SCOPE

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

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

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

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

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section Item

01160 Regulatory Requirements

01300 Submittals

1.3 REFERENCES

This Section references the latest revisions to the following documents:

<u>Reference</u> <u>Title</u>

MUTCD Manual of Uniform Traffic Control Devices

Washington State Modifications to the MUTCD

Quality Guidelines for Temporary Traffic Control Devices

ANSI 107 High Visibility Garment Standard

1.4 TRAFFIC CONTROL MANAGEMENT

A. GENERAL

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

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

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

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

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

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

C. TRAFFIC CONTROL SUPERVISOR

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

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

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

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

1.5 TCM AND TCS QUALIFICATIONS

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

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

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

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

1.6 SUBMITTALS

A. TRAFFIC CONTROL PLAN

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

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

Maintain at least one-way traffic on through roads.

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

PART 2 PRODUCTS

2.1 TRAFFIC CONTROL DEVICES

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

2.2 CONSTRUCTION SIGNS

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

Construction signs will be divided into two classes. Class A construction signs are those signs that remain in service throughout the construction or during a major phase of the work. They are mounted on posts, existing fixed structures, or substantial supports of a semi-permanent nature. Sign and support installation for Class A signs shall be in accordance with the WSDOT Standard Plans. Class A signs shall be designated as such on the Traffic Control Plan. Class B Construction signs are those signs that are placed and removed daily, or are used for short durations which may extend for 1 to 3 days. They are mounted on portable or temporary mountings.

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

PART 3 EXECUTION

3.1 GENERAL

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

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

3.2 TRAFFIC CONTROL LABOR

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

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

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

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

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

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

DIVISION 2 SITEWORK

LOCATE EXISTING UTILITIES

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

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

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 GENERAL

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

The Contractor shall locate existing utilities sufficiently ahead of construction so that the Engineer can modify the alignment, or grade prior to construction. Where underground utilities are found to be in the way of construction, such condition shall not be deemed to be a changed or differing site condition. If necessary, pipe alignment or grade shall be modified at the Contractor's expense.

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

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

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

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

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

1.3 **DEFINITIONS**

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

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 DISPOSAL OF CLEARING AND GRUBBING DEBRIS

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

3.2 CLEARING AND GRUBBING

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

This work shall include removal and disposal of all trees, logs, brush, stumps, roots, and minor manmade structures to include but not limited to concrete, asphalt abandoned metal and equipment, rubbish and debris to the limits indicated on the plans or as required and approved by the owner. This work shall be to a depth necessary to remove stumps, large roots and all other objectionable material. This work shall also include the protection from injury or defacement of trees, bushes, shrubs, and other objects designated to remain.

DEWATERING

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01160	Regulatory Requirements
01200	Measurement and Payment
01300	Submittals
02300	Earthwork
02370	Erosion Control

1.3 SUBMITTALS

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

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

REFERENCES

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

Geotechnical Report, Mason County PUD No. 1 – Manzanita Substation, Union, Washington, GeoEngineers (June 3, 2022), Appendix B.

1.4 QUALITY CONTROL

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

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

PART 2 PRODUCTS

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

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

PART 3 EXECUTION

3.1 INSTALLATION AND APPLICATION

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

undisturbed state of the foundation soils, prevent disturbance of backfill and prevent movement of all structures and pipelines.

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

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

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

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

3.2 MONITORING

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

3.3 FIELD QUALITY CONTROL

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

Should settlement be observed, the Contractor shall cease dewatering operations and implement contingency plans as outlined in the Contractor's approved dewatering plan. The responsibility for conducting the dewatering operation in a manner that protects adjacent structures and facilities rests solely on the Contractor. The cost of repairing any damage to adjacent structures and

restoration of facilities shall be the responsibility of the Contractor. Permanent piping systems, existing or new, <u>shall not be incorporated</u> into the Contractor's dewatering system.

TEMPORARY SHORING AND BRACING

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the temporary shoring and bracing for excavations including the trench excavation safety systems as shown on the Plans and as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02300	Earthwork
02511	Connection to Existing System
02530	Utility Structures
15050	Piping Systems

1.3 SUBSURFACE CONDITIONS

Two test borings were drilled on the proposed reservoir and booster pump station site as part of the design process for this project. Results from these borings are provided in the Appendix B.

1.4 WORK INCLUDED

The extent of temporary shoring and bracing work includes, but is not limited to:

- A. Temporary shoring and bracing necessary to protect the following against loss of ground or caving embankments: existing structures, buildings, roads, walkways, utilities, electrical transmission towers and support wiring, other facilities and improvements where required to comply with codes and authorities having jurisdiction.
- B. Trench excavation safety systems, pursuant to RCW Chapter 49.17 and WAC 296-155-655.
- C. Maintenance of shoring and bracing.

1.5 QUALITY ASSURANCE

A. SHORING CONSULTANT

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

B. SHORING DESIGN

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

C. REGULATIONS

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

1.6 SUBMITTALS

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

1.7 PROJECT CONDITIONS

A. SITE SURVEY

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

The Contractor shall survey adjacent structures and facilities, establishing exact elevations at fixed points to act as temporary bench marks to monitor potential settlement from the contractor's ongoing operations. Clearly identify temporary bench marks and record existing elevations from the control points shown on the Plans.

During excavation, the Contractor shall resurvey bench marks weekly. The Contractor shall maintain and make available at the job site an accurate log of surveyed elevations for comparison with original elevations, and promptly notify the Owner if changes in elevations occur or if cracks, sags or other damage is evident.

1.8 EXISTING UTILITIES

The Contractor shall protect existing active sewer, water, gas, electrical, and other utility services and structures that may be present. This shall also include all pipelines, services, and structures that are the property of the Owner.

PART 2 PRODUCTS

The Contractor shall provide suitable shoring and bracing materials, which shall support loads imposed. Materials for shoring systems need not be new, but shall be in serviceable conditions.

PART 3 EXCAVATION

3.1 VERIFICATION OF CONDITIONS

The Contractor shall notify the Owner immediately if, during construction, subsurface conditions are different from those encountered in the exploratory holes.

3.2 INSTALLATION AND APPLICATION

The Contractor shall provide shoring systems adequately anchored and braced to resist earth and hydrostatic pressures at locations as needed to support excavations during construction. The Contractor shall locate required bracing to clear all permanent work. Bracing which must be relocated shall be installed prior to the removal of original bracing. The Contractor shall not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to the Owner. The Contractor shall maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.3 REMOVAL

The Contractor shall remove shoring and bracing in stages to avoid disturbances to adjacent and underlying soils and damage to structures, pavements, facilities and utilities. The Contractor shall repair or replace, as acceptable to the Owner, adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

3.4 EXCAVATION SAFETY SYSTEMS

All work shall be carried out with due regard for public safety. Open trenches shall have proper barricades and at night they shall be distinctly indicated by adequately placed lights, as provided for elsewhere in the Specifications.

The Contractor is reminded that the Owner has not so delegated, and the Owner's Representative does not purport to be a trench or excavation system safety expert, is not so engaged in that capacity under this Contract, and has neither the authority nor the responsibility to enforce construction, safety laws, rules, regulations, or procedures or to order the stoppage of work for claimed violations of trench or excavation safety.

The furnishing by the Owner of resident representation and inspection personnel shall not make the Owner responsible for the enforcement of such laws, rules, regulations, or procedures, nor shall such make the Owner responsible for construction means, methods, techniques, sequences, procedures, or for the Contractor's failure to properly perform the work necessary for proper trench and excavation safety.

EARTHWORK

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01500	Temporary Facilities
02240	Dewatering
02250	Temporary Shoring and Bracing
02305	Wet Weather Earthwork
02370	Erosion Control
02700	Gravel Materials
02900	Landscaping
15050	Piping System

PART 2 PRODUCTS

2.1 GRAVEL MATERIALS

All gravel materials shall conform to Section 02700.

PART 3 EXECUTION

3.1 PREPARATION

Excavation may commence once all erosion control measures are in place in accordance with the Plans and Section 02370 and to the satisfaction of the Owner.

3.2 GENERAL REQUIREMENTS

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

All excavation performed on this Project shall be considered unclassified. Excavation shall consist of the removal of any and all material encountered, including debris, rubble, concrete, metal, topsoil, cutting and removal of existing surfacing, tree stumps, trees, logs, abandoned rail ties, abandoned piping, piling, riprap, etc.

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

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

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

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

3.3 EXCAVATION AND BACKFILL FOR STRUCTURES

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

Excavation shall consist of the removal of any and all material encountered to the elevations shown on the Plans. Excavations for structures shall be continued down to the subgrade as shown on the Plans.

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

In the event unsuitable material is encountered below the subgrade shown on the Plans and described herein, the Contractor, as required by the Engineer, shall over-excavate until a suitable foundation is reached. If over-excavation of unsuitable material is required by the Engineer, it will be under the unit price bid item entitled "UNSUITABLE EXCAVATION," as described in Section 01200.

The Contractor shall then replace the material with compacted GRAVEL BORROW, as specified in Section 02700. If imported GRAVEL BORROW is required; it will be paid under the unit price bid item titled "GRAVEL BORROW," as specified in Section 01200. Quantities, if any, shall be calculated by neat line measurement to the depth agreed to in the field by the Engineer.

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

Backfill for structures shall be suitable native material, free of organics and particles greater than 4 inches or GRAVEL BORROW as specified in Section 02700.

There is no warranty that the native material is suitable for backfill or is suitable, as excavated, for placement and compaction as required by these Specifications. In the event that the Contractor is unable to find onsite, sufficient native material to accomplish the structure backfilling, the select material that he shall furnish and install shall be GRAVEL BORROW, as specified in Section 02700.

3.4 PROTECTION OF FOUNDATION SURFACES

Care shall be taken to preserve the foundation surfaces shown on the Plans in an undisturbed condition. If the Contractor unnecessarily over excavates or disturbs the foundation surfaces shown on the Plans or specified herein without written authorization of the Engineer the Contractor shall replace such foundations with concrete fill or other suitable material approved by the Owner in a manner which will show by test an equal bearing capacity with the undisturbed foundation material. No additional payment shall be made for the added quantity of concrete fill or other suitable material used because of unnecessary over excavation caused by the Contractor or their operations.

3.5 EXCAVATION AND BACKFILL FOR TRENCHES

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

- PVC
- Polyethylene Tubing
- Polyethylene

All other pipe materials shall be considered rigid.

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

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

The width of the trench at or below a point 12 inches above the top of the outside diameter of the pipe shall be carefully controlled and maintained to ensure the strength of the pipe and prevent pipe failures. Backfilling shall proceed as follows:

A. SUBGRADE PREPARATION

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

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

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

B. BEDDING FOR RIGID PIPE

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

C. BEDDING FOR FLEXIBLE PIPE

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

D. BACKFILL FOR TRENCHES

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

From the point 12 inches above the top of the pipe barrel, the backfill material to be used in the trench section shall be suitable native material or Gravel Borrow, as specified in Section 02700, except where required or shown on the Plans to use other material. The Contractor shall place backfill in horizontal lifts not to exceed 8 inches in thickness. All backfill shall be free of large rocks, organic matter, stumps, trees, pieces of pavement, broken concrete and other deleterious substances.

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

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

3.6 ROCK EXCAVATION

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

boulders that are smaller than the larger of: (1) 2 cubic yards in volume, or (2) the volume that can be readily handled by the largest backhoe being utilized on the job by the Contractor, they shall be considered incidental to excavation.

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

3.7 REUSE AND DISPOSAL OF EXCAVATED MATERIAL

Excavated materials shall be properly protected and reused where possible. Excavated materials not used for fill shall be hauled to an approved waste site(s), as selected by the Contractor. The Contractor shall submit a list of approved waste haul site(s) to the Owner prior to the commencement of hauling of waste materials. Any permits required for waste haul and disposal shall be the responsibility of the Contractor.

3.8 FINAL SITE GRADING

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

3.9 STRUCTURE COMPACTION

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

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

Wall backfill material shall be compacted to at least 90 percent of the maximum dry density, using the Modified Proctor, per ASTM D1557 within 5 feet of all walls and shall be compacted to at least 95 percent of the maximum dry density, using the Modified Proctor, per ASTM D1557 beyond 5 feet of all walls. Any

and all compaction within 5 feet of all walls shall be accomplished by means of hand-operated mechanical equipment rather than heavy equipment compactors.

3.10 TRENCH COMPACTION

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

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

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

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

WET WEATHER EARTHWORK

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02300	Earthwork
02370	Erosion Control
02700	Gravel Materials

PART 2 PRODUCTS

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

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

PART 3 EXECUTION

3.1 WET WEATHER EXCAVATION AND FILL PLACEMENT QUALITY CONTROL

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

3.2 WET WEATHER EARTHWORK PROTECTION

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

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

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

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

EROSION CONTROL

PART 1 GENERAL

1.1 SCOPE

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

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

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

1.3 SUBMITTALS

A. Stormwater Pollution Prevention Plan (SWPPP)

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

1.4 CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (CESCL)

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

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

- A. Inspecting temporary erosion and spill control Best Management Practice (BMPs) for proper location, installation, maintenance, and repair.

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

1.5 STORMWATER POLLUTION PREVENTION PLAN

The CESCL Contractor shall be responsible for preparing a Stormwater Pollution Prevention Plan (SWPPP). The intent of the SWPPP is to reflect the Contractor's operations by supplementing the TESC Drawings, details, and notes shown on the Plans to provide comprehensive pollution control at the construction site, staging areas, stockpiles, and borrow sites. The SWPPP shall be prepared by the CESCL for the project and submittal in accordance with Section 01300. The SWPPP shall be submitted to the Owner for approval at the preconstruction conference. **No work shall begin until the Contractor's SWPPP, as approved by the Owner, is implemented.** The SWPPP shall address, at least, the following items:

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

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

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

PART 2 PRODUCTS

2.1 SILT FENCES

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

Mason County PUD No. 1
Manzanita Reservoir and Booster Pump Station
G&O #22260 02370-3 – Erosion Control

2.2 STORM DRAIN INLET (CATCH BASIN) PROTECTION

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

2.3 WATTLES

Wattles shall conform to the details shown on the Plans and shall meet the requirements of Section 9-14.6(5) of the WSDOT Standard Specifications.

PART 3 EXECUTION

3.1 PREPARATION

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

3.2 BEST MANAGEMENT PRACTICES (BMPS)

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

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

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

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

DISINFECTION

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes disinfection of potable water piping, distribution mains, and structures; testing; and reporting results.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section Item

Division 15 Mechanical

1.3 REFERENCES

- A. AWWA B300 Standard for Hypochlorites.
- B. AWWA B301 Standard for Liquid Chlorine.
- C. AWWA B302 Standard for Ammonium Sulfate.
- D. AWWA B303 Standard for Sodium Chlorite.
- E. AWWA C651 Standards for Disinfecting Water Mains.

1.4 SUBMITTALS

A. TEST REPORTS

Indicate results comparative to specified requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01300.
- B. DISINFECTION REPORT; RECORD
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and time of completion.

Mason County PUD No. 1
Manzanita Reservoir and Booster Pump Station
G&O #22260 02510-1 – Disinfection

- 3. Test locations.
- 4. Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
- 5. Date and time of flushing start and completion.
- 6. Disinfectant residual after flushing in ppm for each outlet tested.

C. BACTERIOLOGICAL REPORT; RECORD

- 1. Date issued, project name, and testing laboratory name, address, and telephone number.
- 2. Time and date of water sample collection.
- 3. Name of person collecting samples.
- 4. Test locations.
- 5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
- 6. Coliform bacteria test results for each outlet tested.
- 7. Certification that water conforms, or fails to conform, to bacterial standards of the Department of Health.
- 8. Bacteriologist's signature and authority.

1.6 QUALITY ASSURANCE

Perform Work in accordance with AWWA C651.

1.7 REGULATORY REQUIREMENTS

Conform to Department of Health code or regulation for performing the work of this Section.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that piping system has been cleaned, inspected, and pressure tested.
- B. Perform scheduling and disinfection activity prior to startup, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 WATER PIPE DISINFECTION

- A. Provide and attach required equipment to perform the work of this Section.
- B. Inject treatment disinfectant into piping system.
- C. Maintain disinfectant in system for 24 hours.
- D. Replace permanent system devices removed for disinfection.
- E. Water for disinfection must be obtained by the Contractor by arrangement with the Owner. The following describe specific procedures to be used by the Contractor in maintaining a satisfactory environment for prevention of contamination of the proposed water system installation, the cleanliness of the pipe and fittings and the actual method of disinfection.
- F. When the line is completed and ready to disinfect, water shall be allowed to flow in slowly, until it appears at the far end of the line so as not to displace the disinfecting agent. The system shall then be allowed to stand for at least 24 hours. The line shall then be flushed through the drain stations until a test shows no more than two parts per million of available chlorine.
- G. In all instances, the Contractor shall utilize a state approved double check valve type backflow prevention device to protect the potable water supply while filling, flushing and disinfecting the particular water main.

- H. Where connections are made to existing facilities and it is impractical to use the methods described herein to disinfect the section between the existing water main and the point of isolation of the new water main (valve or temporarily plugged line) or where pipes and fittings require immediate use, cleaning and disinfecting shall be directed by the Owner.
- I. The Contractor is herein advised that prior to making any restorations or permanent connections to the existing water mains, that the Contractor shall first demonstrate to the Owner, that the new water main has adequately passed a pressure test, been adequately flushed, and finally passed the required bacteriological test.
- J. In all disinfection processes, the Contractor shall take particular care in flushing and wasting the chlorinated water from the mains to assure that the flushed and chlorinated water does no physical or environmental damage to property, streams, storm sewers or any waterways. The Contractor shall chemically or otherwise treat the chlorinated water to prevent damage to the effected environment, particularly aquatic and fish life of receiving streams. The method and the time of flushing is to be approved by the Owner.
- K. Before placing the lines in service, satisfactory results must be obtained on samples collected from representative points in the new system and submitted to a State DOH approved laboratory. The Owner shall collect all samples for the bacteriological tests. However, the Contractor shall notify the Owner for collection of samples two days in advance, and schedule on days wherein samples can be conveniently processed by State DOH approved laboratory. If any of the pipeline materials are replaced thereafter, then that section shall again be disinfected and tested for bacteriological count.

If disinfection of mains by the above methods, prove unsatisfactory and the lab report indicates any type of bacteria count, then the Owner may direct the Contractor to use one of the following two disinfection methods until a satisfactory report is obtained. No additional compensation will be made to the Contractor for any work necessary to achieve a satisfactory bacteriological test result.

L. METHOD 1

1. Calcium or Sodium Hypochlorite or Chlorinated Lime in Water

A mixture of either calcium or sodium hypochlorite or chlorinated lime of known chlorine content and water may be used. (Typical commercial products of this type are Perchloron (HDH), Multichlor, Purex, etc.)

2. Proportions of Chlorine Compound and Water Mixtures

Prepare a solution containing approximately 5 percent available chlorine by weight. In the case of Perchloron, at 70 percent available chlorine, use 6 pounds per 10 gallons of water. In the case of 12.5 percent hypochlorite, add 2.5 parts water to 1 part of 12.5 percent hypochlorite. For other strength compounds, adjust the dilution accordingly.

3. Preparation of Chlorine Compound

To prepare the chlorine compound-mixture from a powder, first make a paste, and then thin to a slurry to ensure getting all active ingredients into solution. The prepared solution shall be injected by means of a hypochlorinator, or hand or engine operated pump. The rate chlorine-water mixture shall be in such proportion to the rate of water entering the newly laid pipe that the dose applied to the water entering the newly laid pipe will be at least 50 parts per million. A color comparator set shall be used to determine chlorine residual. For solutions containing approximately 5 percent available chlorine, the rate of bleeding the main to be sterilized should be 1,000 times the rate of feed or injection of the chlorine solution.

4. Cross-Connection Prevention

A cross-connection control device (DOH approved) shall be utilized to prevent potential cross-connections.

5. Retention Period

Treated water shall be retained in the pipe at least 24 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 5 parts per million.

6. Chlorinating Valves and Hydrants

In the process of chlorinating newly laid water pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

7. Final Flushing and Chlorine Residual Test

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length, upon test, shows the absence of chlorine (or in the event chlorine is normally used in the source of supply, then the tests shall show a residual not in excess of that carried by the system). A state-approved bacteriological test shall then be conducted.

8. Repetition of Procedure

Should the initial treatment prove ineffective, the chlorination procedure shall be repeated until tests show that the water sample from the newly laid pipe conforms to the requirements of these Specifications.

3.3 RESERVOIR DISINFECTION

Reservoirs shall be disinfected in accordance with AWWA C652 (Disinfection of Water Storage Facilities).

Bacteriological sampling and testing shall be in complete compliance with AWWA C653-87 Section 5.3 and the requirements of the Washington State Department of Health.

3.4 QUALITY CONTROL

Samples shall be taken and tested in accordance with AWWA C651.

END OF SECTION

CONNECTION TO EXISTING SYSTEM

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the connection of pipelines being constructed under this project to existing water mains as shown on the Plans and as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section Item

01200 Measurement and Payment

Division 15 Mechanical

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

All cut-in connections to the existing system shall be made after a successful pressure test of the new main has been witnessed by the Owner and after a purity test has been satisfactorily evidenced except as allowed by the Owner.

The location, type and size of existing facilities have been determined from available records and are approximate. It is anticipated that connections to these existing facilities may be made, in general, as shown on the Plans except adjustments may be required for vertical and horizontal alignment.

It shall be the responsibility of the Contractor to determine the exact location and ascertain the type and size of the existing facilities prior to starting work on each connection and to provide any alternations as required in the connection detail.

Connections to existing facilities shall be made with the use of fittings, valves, flexible couplings, solid sleeves, shackling and other miscellaneous fittings, and thrust blocks as shown on the or with additional pipe or fittings as approved by the Owner and as indicated in Piping Systems to connect the new construction under this Project to the existing pipelines.

All pipe and fittings used for the connection shall be clean and disinfected with a minimum 5 percent chlorinated solution immediately prior to making said connection. The Contractor shall take extra precautions to ensure the tightness of the connections, nuts, and bolts. The existing water main shall be placed back into service by the Owner and the connection observed by the Owner prior to backfilling the pipe.

All valves shall be operated by Owner personnel only. Where it is necessary to shut off the existing mains to make a connection, the Contractor shall notify the Owner and all water customers affected 48 hours in advance of such shut off, and the Owner will shut off the mains. Once the water has been shut off, the Contractor shall diligently pursue the connection to completion so that the time required for the shut off is held to a minimum.

All connections to existing mains shall be completed the same day as they are started. The Contractor shall time its operations so that the water will not be shut off overnight or over weekends or during holidays.

*** END OF SECTION ***

UTILITY STRUCTURES

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

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

PART 2 PRODUCTS

2.1 GENERAL

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

2.2 RINGS AND COVERS

Castings for manhole rings shall be gray-iron conforming to the requirements of ASTM A48/AASHTO M105, Grade 30B. Covers shall be ductile iron conforming to ASTM A536, Grade 80-55-06. All rings and covers shall be of uniform quality, free from blowholes, porosity, shrinkage, distortion, cracks, or other defects. Repair of defects shall not be permitted. All mating surfaces shall be machined finished to ensure a nonrocking fit. All covers shall be interchangeable within the dimensions as shown on the Plans and marked "sewer," "drain," or "water" as appropriate. Locking/tamperproof covers shall be secured to the ring with three 5/8-inch stainless steel Allen head cap screws. When watertight covers are required the locking style ring and covers shall be used and include a machined groove in the seat of the ring or underside of the cover and a gasket installed to assure a watertight seal. Covers shall be without pickholes. The manufacturer's identification shall be cast with a minimum of

1/2-inch letters on exposed surfaces. Manhole rings and covers shall have a design wheel load conforming to AASHTO/ASTM A16 design loading HS20-44.

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

2.3 STEPS

Polypropylene manhole steps shall be made of a copolymer polypropylene, superior in its resistance to corrosion, meeting the requirements of ASTM D4101 Type II, Grade 16906, and shall completely encapsulate a deformed 1/2-inch steel reinforcing rod conforming to ASTM A615, Grade 60. Polypropylene steps shall be factory installed in complete accordance with the manufacturer's instructions. This shall be accomplished by predrilling two parallel 1-inch holes, 3-3/4-inch deep, and 13-inches on center in the cured concrete base, riser, and taper sections of the manhole. The insertion ends of the step shall be fully coated with non-shrink epoxy grout then driven into the holes to the prescribed depth. In no case will the predrilled hole be allowed to penetrate through the wall of the manhole section.

Steps shall be Lane International Corporation Manhole Step or equal.

2.4 PRECAST CONCRETE CATCH BASINS

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

Precast base sections for Type 2 catch basins shall conform to the requirements for precast riser sections. The base shall be a minimum of 6-inches thick underneath the pipe invert. Catch basins Type 2 shall contain steps in accordance with Section 2.5.

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

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

2.5 FRAMES AND GRATES

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

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

2.6 GASKETS AND MANHOLE ADAPTERS

Rubber gaskets shall conform to Section 9-04.4 of the WSDOT Standard Specifications. Pipe connections to existing manholes shall be made using a heavy duty sand collar with gasket, head, or equal. Pipe connections to new manholes or vaults shall utilize an adaptor coupling with gasket or watertight flexible rubber boot, Kor-n-Seal or equal. The Contractor shall provide Kor-n-Seal cavity O-rings to fill the annular spaces between the pipe and the manhole or vault wall.

PART 3 EXECUTION

3.1 CATCH BASINS

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

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

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

3.2 FINAL ADJUSTMENT AND CLEANUP

After installation is complete, the Contractor shall cleanout all precast structures prior to placing the new facilities into service. The adjustment of castings shall be

done in a manner satisfactory to the Owner. Adjustment shall be done only with precast grade rings. Bricks are unacceptable. Grouting and final adjustment of castings shall be done with non-shrink grout.

*** END OF SECTION ***

GRAVEL MATERIALS

PART 1 GENERAL

1.1 SCOPE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02300	Earthwork
02305	Wet Weather Earthwork
02710	Gravel Surfacing

1.3 SUBMITTALS

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

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

PART 2 PRODUCTS

2.1 GRAVEL BACKFILL FOR PIPE BEDDING

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

2.2 GRAVEL BORROW

Gravel borrow shall be free from organic matter or other deleterious materials and in conformance with Section 9-03.14(1) of the WSDOT Standard Specifications.

2.3 CRUSHED SURFACING

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

2.4 **OUARRY SPALLS**

Quarry spalls shall conform to Section 9-13 of the WSDOT Standard Specifications. Materials used for quarry spalls shall meet the requirements of Section 9-13.1(5) of the WSDOT Standard Specifications, except that the size of material shall be revised as follows: 100 percent passing a 4-inch sieve size and 40 percent passing a 2-inch sieve size.

2.5 PEA GRAVEL

Pea gravel shall be relatively round, processed, washed rock conforming to ASTM C33 with the following sieve analysis.

Sieve Analysis (% Passing by Weight)		
Sieve Size	Percent Passing	
1/2"	100	
3/8"	85-100	
No. 4	10-30	
No. 8	0-10	
No. 16	0-5	

2.6 MISCELLANEOUS GRAVEL

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

PART 3 EXECUTION

3.1 GRAVEL BACKFILL FOR PIPE BEDDING

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

3.2 GRAVEL BORROW

Gravel borrow shall be placed where shown on the Plans.

3.3 CRUSHED SURFACING

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

3.4 QUARRY SPALLS

Quarry spalls shall be placed where shown on the Plans, where foundations are unsuitable if approved by the Owner or in other locations where approved by the Owner.

3.5 PEA GRAVEL

Pea gravel shall be placed as backfill around flexible expansion couplings as shown in the Plans, a minimum of 12 inches in all directions.

3.6 MISCELLANEOUS GRAVEL

Miscellaneous gravel shall be installed per the Plans.

*** END OF SECTION ***

GRAVEL SURFACING

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the installation of crushed surfacing materials.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02300	Earthwork
02700	Gravel Materials

1.3 SUBMITTALS

The Contractor shall provide the Owner with a certificate of laboratory test indicating gradation of each material provided in accordance with Section 01300. The certificate shall be provided to the Owner 5 calendar days prior to placement of any materials.

PART 2 PRODUCTS

2.1 GRAVEL MATERIALS

All gravel materials shall conform to the requirement of Section 02700.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

The subgrade shall be prepared as per Section 2-06.3 of the WSDOT Standard Specifications. As the rolling of the subgrade proceeds, all soft or spongy areas shall be removed and the resulting holes filled with ballast material or crushed surfacing base course as shown on the Plans. The Contractor shall dispose of excess materials resulting from the preparation of the subgrade. Rollers shall not be operated adjacent to structures where such use may cause damage. Where the subgrade abuts structures and compaction with a roller is not possible for practical

reasons, the area shall be compacted with mechanical tampers or other approved equipment.

3.2 GRAVEL MATERIAL

Gravel materials shall be placed in the layers and thickness as shown on the Plans. Gravel materials shall be placed in accordance with Section 4-04.3 of the WSDOT Standard Specifications.

The Contractor shall place gravel materials in a uniform layer over the entire area to receive gravel materials without segregation of sizes, to such depth that when compacted with the power roller, the course shall have the required thickness. The maximum layer thickness for compaction with a roller shall be 6 inches for ballast or base course and 4 inches for crushed surfacing. The gravel material shall be bladed with a grader and rolled while damp with a power roller until the course is thoroughly and uniformly compacted and until its surface is smooth and conforms to grade and crown requirements shown on the Plans. The cross-section of the finished surface shall be subject to reasonable variations as approved by the Owner to meet the varying conditions encountered. The surface shall be maintained in its finished condition until the succeeding layer is placed.

The roller shall not be operated adjacent to structures where such use may cause damage. Where the gravel materials abuts structures and compaction with a roller is not possible for practical reasons, the area shall be compacted with mechanical tampers or other approved equipment.

3.3 COMPACTION

All materials shall be compacted to a dense, unyielding state of at least 95 percent of the maximum dry density, using the modified Proctor, per ASTM D1557.

END OF SECTION

CHAIN LINK FENCE AND GATES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the furnishing and installing of chain link fencing and gates conforming to the lines, grades, and details and at the locations as shown on the Plans.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
03300	Cast-in-Place Concrete

PART 2 PRODUCTS

2.1 FENCING

Chain link fencing shall conform to Section 9-16 of the WSDOT Standard Specifications, and shall be a Type 3 fence per WSDOT Standard Plan, with the following exceptions. The fence shall have continuous chain link wire, tension wire. The chain link shall have a 2-inch diamond mesh and 9-gauge wire, meeting ASTM 668, Class 2b. The chain link fence and all accessories shall be galvanized finish. The total height of the fence shall be as shown on the Plans. The fence shall be heavy steel guard fence with top rail and bottom tension wire.

Rails, posts, and accessories shall be galvanized with 1.8 ounces per square foot.

2.2 GATES

Gates shall be installed for the full opening shown on the Plans as per the manufacturer's recommendations. The Contractor shall furnish padlocks and keys for gates, which comply with Owner standards. Gates shall conform to WSDOT Standard plan L-30, the Plans, and ASTM F900.

Gate posts shall be provided in accordance with ASTM F900 and have a ball top.

PART 3 EXECUTION

3.1 TEMPORARY FENCING

The Contractor shall furnish and install temporary fencing around the site so as to protect the site and prevent unauthorized entry into the site. The Contractor shall also maintain the temporary fencing throughout the course of the construction and provide any and all security necessary for site safety and protection during periods when sections of the fence may be down or open. Temporary fencing shall be removed by the Contractor only after receiving written authorization from the Owner for its removal.

3.2 FENCING INSTALLATION

The chain link fencing shall be erected in straight lines between angle points by skilled workmen experienced in this type of construction, in accordance with the manufacturer's recommendations and these Specifications. The new fence installation shall not commence until final grading is complete and finish grade elevations are established. The new fence shall be constructed to provide security for the site. There shall not be any gaps between finish elevations and the bottom links of the fence, which would allow entrance into the site.

The site fence shall be constructed in conformance with Section 8-12 of the WSDOT Standard Specifications. The maximum spacing for line posts shall be 10-feet on center. Post holes shall be a minimum depth of 3 feet below finished grade; holes for line posts shall be 10 inches in diameter; holes for gate, corner, and pull posts shall be four times the diameter of the post. Posts shall be set plumb in true line and to the depth of 3 feet and the remainder of the hole filled with concrete that must extend around the posts to a point 2 inches above finished grade. The top surface shall have a crowned watershed finish.

Concrete shall be proportioned to provide at least 2,500 psi strength at 28 days. Materials, methods of proportioning, mixing, transporting and placing shall conform to Section 03300. After the concrete has set, accessories shall be installed; chain link fabric shall be fastened to end posts with stretcher bars and clamps and to line posts and top rail with wire or bands at approximately 14-inch centers and 24-inch centers, respectively.

3.3 GATE INSTALLATION

Install gateposts in accordance with manufacturer's instructions.

Gate posts shall be diagonally braced to adjacent line posts to ensure stability. Gates shall be hung and all hardware adjusted so that gates operate satisfactorily from open or closed position.

Concrete set gateposts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter four times greater than outside dimension of post, and depths approximately 6-inches deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36 inches below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish around post and slope to direct water away from posts. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

Install gates plumb, level, and secure for full opening without interference.

Attach hardware by means which will prevent unauthorized removal. Adjust hardware for smooth operation.

END OF SECTION

LANDSCAPING

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the installation of all landscaping work as shown on the Plans and as specified herein. Landscaping activities shall include work both at the project location as well as any residential properties that are affected by construction activities.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01200	Measurement & Payment
01300	Submittals
02230	Clearing & Grubbing
02300	Earthwork

1.3 SUBMITTALS

A. SEED MIX

See Section 2.4 of this Specification.

1.4 QUALITY ASSURANCE

A. SEED

Conform to the minimum standards for "certified" grade seed.

Furnished in standard container on which the following information is shown: seed name, lot number, net weight, percentage of purity, germination, weed seed and inert material.

Furnish to the Owner duplicate copies of a statement signed by the vendor, certifying that each lot of seed has been tested by a recognized seed testing laboratory within 6 months before the date of delivery on the Project.

Seed that is wet, moldy, or otherwise damaged in transit or storage will not be accepted.

PART 2 MATERIALS

2.1 TOPSOIL

The topsoil shall consist of 67 percent sandy loam and 33 percent composted organic material by volume.

The soil shall meet the following requirements:

Soil shall be sandy loam or loamy sand consisting largely of sand, but with enough silt and clay present to give it a small amount of stability. Individual sand grains can be seen and felt readily. On squeezing in the hand when dry, it shall fall apart when the pressure is released; on squeezing when moist, it shall form a cast that does not only hold its shape when the pressure is released, but shall withstand careful handling without breaking.

The mixed soil shall meet the following gradation:

Screen Size	Percent Passing
1/2 inch	100
1/4 inch	95 - 100
#10	85 - 95
#30	60 - 75
#60	50 - 60
#100	20 - 30
#200	5 - 15

Shall have a pH range of 5.5 to 7.5. Soils indicated having a pH below 5.5 shall be treated with dolomitic limestone as necessary to attain this pH range. Soils having a pH greater than 7.5 shall be treated with sulfur as necessary to attain this pH range. The pH shall be determined by soil test.

Organic material shall consist of composted yard debris or organic waste material composted for a minimum of 3 months. Compost shall consist of 100 percent recycled content. In addition, the organic material shall have the following physical characteristics:

- 1. Shall pass a standard cress test for seed germination (90 percent germination compared to standard).
- 2. Shall have a pH from 5.5 to 7.5.
- 3. Shall have a maximum electrical conductivity of 3.0 ohms/cm.
- 4. Shall have a maximum carbon to nitrogen ratio of 40:1.

5. Shall be certified by the "Process to Further Reduce Pathogens" (PFRP) guideline for hot composting as established by the United States Environmental Protection Agency.

Submit a certified laboratory analysis from an accredited soils testing laboratory indicating the Material source and compliance with all planting soil Specifications to the Engineer for approval before delivery to the Project Site. The analysis shall be with a sample size of no less than 1 pound.

2.2 COMPOST

Composted material shall be derived from a Type 1 feedstock and produced by a facility in compliance with WAC 173-350-220. The compost shall meet Grade AA Compost as defined by Ecology's Interim Guidelines for Compost Quality (Publication #94-38, Revised November 1994). Compost material shall have 100 percent passing a 1/2-inch screen. The carbon to nitrogen ratio (C:N) of the compost shall be in the range of 20:1 to 35:1. Organic matter of the composted material shall be between 4 percent and 10 percent, and the moisture content shall be between 35 percent to 50 percent as determined by ASTM D 2974. The pH of the compost shall be within the range of 5.5 to 7.0 as determined by ASTM D 2976. The maximum electrical conductivity of composted material shall be 6 ohms/cm. Decomposed Organic Compost shall be mature as determined by US Composting Council stability test ratings referred to in the Ch 173-350 WAC. The product shall be tested within 6 months of proposed use.

2.3 SEEDING, FERTILIZING, AND MULCHING

All areas that have been cleared and grubbed, graded, and where restoration is required, shall receive seeding, fertilizing and mulching. These areas shall be leveled, acceptable to the Owner, existing topsoil broken up to a depth of 6 inches and hydroseeded. Graded areas shall receive 6 inches of Class A topsoil prior to hydroseeding. Native materials selected by the Engineer from material excavated for foundations and stockpiled on site shall be used for topsoil.

For those areas in which hydroseeding would be difficult, the Contractor may request approval from the Owner to hand-apply the hydroseeding mix. Approval shall be granted for hand-application only after reviewing and approving the procedure that the Contractor recommends.

Seeding, fertilizing and mulching shall be installed using an approved-type hydroseeder.

The seed mixture shall have the following composition, proportion and quality:

Alternative 1 Seed Mixture Typical Western Washington

		Minimum	Minimum
Kind and Variety of Seed	Percent By	Percent of	Percent of
in Mixture	Weight	Pure Seed	Germination
Colonial Bent Grass (Highland or			
Astoria)	10%	9.8%	85%
Creeping Red Fescus (Illahee Rainier			
or Pennlawn)	40%	39.2%	90%
Perennial Rye Grass	30%	29.4%	90%
White Clover (Pre-inoculated)	20%	19.6%	90%
Maximum Percentage of Weed Seed	1.0%		
Maximum Inert and Other Crops	1.0%		

The seed shall be applied at a minimum rate of 120 pounds per acre.

A commercial fertilizer of the following formulation shall be furnished as specified, and all fertilizer shall be premixed prior to use on the job. The fertilizer shall be applied at the rate of 500 lbs. per acre.

Nitrogen (Inorganic) as N ₂	Nitrogen (Organic) Ureaformaldehyde	Phosphorou s as P ₂ 0 ₅	as K ₂ 0	Potassium lbs/Acre
10%	38%	20%	20%	500

Wood cellulose fiber mulch shall be applied at the rate of 2,000 pounds per acre.

2.4 POND RESTORATION

Pond Restoration shall be as shown on the Plans.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY

A. DELIVERY

Deliver fertilizer and soil additives to the site in original unopened containers bearing manufacturer's guaranteed chemical analysis, weight, manufacturer's name, trademark, and conformance with state law.

3.2 SEED INSTALLATION

Seeding, fertilizing and mulching shall be installed in conformance with Sections 8-01 and 9-14 of the WSDOT Standard Specifications.

The seed materials will be applied in two applications. The first application shall consist of seed and a non-toxic tracer. The second application shall consist of a homogenous mixture of fertilizer and wood cellulose fiber mulch, and shall be uniformly applied over the seed within 48 hours of the seed application unless otherwise directed by the Owner.

When weather conditions are not conducive to satisfactory results from seeding operations, the Owner may order the work suspended and it shall be resumed only when the desired results are likely to be obtained.

Inspection is required for each area when seeding and fertilizing is complete, and again after mulching is complete.

Areas not receiving a uniform application of seeding at the specified rate as determined by the Engineer shall be reseeded at the Contractor's expense prior to mulching or payment.

3.3 SEEDED AREA SOIL PREPARATION

Verify that planting bed grades are in accordance with those indicated on the Plans before proceeding with work. Verify that soil conditions are satisfactory for soil preparation work.

Prepare soil no closer than 3 feet from existing tree trunks up to 6 inches in diameter; no closer than 4 feet from existing tree trunks up to 12 inches in diameter; no closer than 6 feet from existing tree trunks larger than 12 inches in diameter.

Loosen compacted soils to a depth of 12 inches. Rake and remove all material larger than 1-1/2 inches in diameter.

Place 2 inches of compost over existing soil, mix and till to a depth of 6 inches. This material shall be suitable topsoil from the site or imported material.

3.4 WEED CONTROL

The Contractor shall use extreme care to ensure chemicals remain within the designated areas. The use of chemical herbicides shall require the use of anti-drift and activating agents and a spray pattern indicator, unless otherwise allowed by the Owner.

All applications of post-emergent herbicides shall be made while green and growing tissue is present. Should unwanted vegetation reach the seed stage in violation of these Specifications, the Contractor shall physically remove and bag the seed heads. All physically removed vegetation and seed heads shall be disposed of offsite at no cost to the Owner.

The Contractor shall assume all responsibility for rendering any area unsatisfactory for planting by reason of chemical application. The Contractor shall replace, repair and pay for all damages caused by his/her negligence to the satisfaction of the Owner prior to final payment.

3.5 PEST CONTROL

The Contractor shall use extreme care to ensure chemicals remain within the designated areas. The use of spray chemical pesticides shall require the use of anti-drift and activating agents and a spray pattern indicator, unless otherwise allowed by the Owner.

The Contractor shall assume all responsibility for rendering any area unsatisfactory for planting by reason of chemical application. The Contractor shall replace, repair and pay for all damages caused by his/her negligence to the satisfaction of the Owner prior to final payment.

3.6 CONSTRUCTION ACCEPTANCE

Construction acceptance shall be subject to well-established seeded areas that fulfill the requirement of the approved Plans. The Contractor shall protect and care for all plantings until fully established and healthy. Care shall include equipment and labor necessary to provide sufficient and continuous watering of all seeded areas until final acceptance.

Final Acceptance of all landscaping work described in this Specification, with the exclusion of possible replacements of plant materials under the Guarantee, shall be made by the Owner to determine 100 percent completion of the Contract work. This review shall be made upon written request to the Owner no less than 48 hours prior to the anticipated date of inspection.

*** END OF SECTION ***

DIVISION 3 CONCRETE

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes reinforcement and associated items for all concrete, including, but not necessarily limited to: reinforcing steel bars, wire fabric, and accessories for cast-in-place concrete.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
03300	Cast-In-Place Concrete
13212	Concrete Reservoir

1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ACI 301	Structural Concrete for Buildings
ACI 318	Building Code Requirements for Structural
	Concrete
ACI SP-66	American Concrete Institute - Detailing Manual
ANSI/ASTM A82	Cold Drawn Steel Wire for Concrete Reinforcement
ANSI/ASTM A185	Welded Steel Wire Fabric for Concrete
	Reinforcement
ANSI/AWS D1.4	Structural Welding Code for Reinforcing Steel
ASTM A615	Deformed and Plain Billet Steel Bars for Concrete
	Reinforcement

1.4 SUBMITTALS

Submit in accordance with provisions of Section 01300.

A. SHOP DRAWINGS

Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.

B. MANUFACTURER'S CERTIFICATE

Certify that reinforcing bar and welded wire fabric meet or exceed specified requirements.

Submit certified copies of mill test reports of reinforcement materials analysis.

1.5 QUALITY ASSURANCE

Perform Work in accordance with ACI 301.

1.6 COORDINATION

Coordinate with placement of formwork, formed openings, and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. REINFORCING STEEL

ASTM A615, deformed bars: Grade 40 for #3 bars and smaller, Grade 60 for #4 bars and larger, unless noted otherwise on the Plans.

B. WELDED STEEL WIRE FABRIC

ASTM A185 Plain Type; in flat sheets; plain.

2.2 ACCESSORY MATERIALS

A. TIE WIRE

Minimum 16-gauge annealed type.

B. CHAIRS, BOLSTERS, BAR SUPPORTS, SPACERS

Sized and shaped for strength and support of reinforcement during concrete placement conditions including load-bearing pad on bottom where required to prevent vapor barrier puncture.

C. SPECIAL CHAIRS, BOLSTERS, BAR SUPPORTS, SPACERS ADJACENT TO WEATHER EXPOSED CONCRETE SURFACES

Plastic-coated steel type; size and shape as required.

D. MECHANICAL BAR SPLICES

Comply with ACI 318 requirement of minimum tensile strength of 125 percent of specified yield for reinforcement.

Subject to compliance with the requirements and approval of the Engineer, products, which may be incorporated into the work include, but are not limited to, the following:

BAR-LOCK (MBT) Coupler Systems "ERICO" REBAR SPLICING

E. ADHESIVE ANCHORS

Injection adhesive system shall consist of a dual-cylinder adhesive refill pack, a mixing nozzle, and dispenser. The adhesive shall be formulated to include resin and hardeners.

- 1. Subject to compliance with the requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - a. HIT RE 500 Injection Adhesive Anchor, Hilti, Inc.
 - b. SET-3G, Simpson Strong Tie, Inc.
 - c. PE1000+, Powers Fasteners, Inc.

2.3 FABRICATION

Fabricate concrete reinforcing in accordance with ACI SP-66. Obtain written approval from the Engineer prior to welding reinforcing steel. Weld reinforcement in accordance with ANSI/AWS D1.4.

PART 3 EXECUTION

3.1 PLACEMENT

Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports, and as herein specified. Avoiding cutting or puncturing vapor barrier during reinforcement placement and concreting operations.

Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal/plastic chairs, runners, bolsters, spacers, and hangers, as required.

Install reinforcing bars with clearance indicated on the Plans. Provide laps as shown and stagger locations to minimize the concentration of multiple reinforcing at joints. Bar lap splicing shall have full contact. Where full contact cannot be achieved, the maximum space between the spliced bars shall not exceed 2 inches. Unless noted otherwise on the Plans, provide two #5 minimum trim bars around all openings and penetrations. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with tie wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

*** END OF SECTION ***

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes schedules, notes, and details for the construction of cast-in-place concrete structures, landings, equipment piers, housekeeping pads and slabs on grade.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
03200	Concrete Reinforcement

1.3 REFERENCES

This Section references the latest revisions of the following documents:

Reference	<u>Title</u>
ACI 117	Specifications for Tolerances for Concrete Construction
	and Materials and Commentary
ACI 212.3	Chemical Admixtures for Concrete
ACI 301	Specifications for Structural Concrete
ACI 304	Guide for Measuring, Mixing, Transporting, and Placing
	Concrete
ACI 305	Hot Weather Concreting
ACI 306	Cold Weather Concreting
ACI 309	Guide for Consolidation of Concrete
ACI 318	Building Code Requirements for Structural Concrete and
	Commentary
ACI 350	Code Requirements for Environmental Engineering
	Concrete Structures and Commentary
ACI 347	Guide to Formwork for Concrete
ACI 350.1	Tightness Testing of Reinforced Engineering Concrete
	Structures and Commentary
ASTM C31	Making and Curing Concrete Test Specimens in the Field
ASTM C33	Concrete Aggregates
ASTM C39	Compressive Strength of Cylindrical Concrete Specimens

ASTM C42	Obtaining and Testing Drilled Cores and Sawed Beams of
	Concrete
ASTM C94	Ready-Mixed Concrete
ASTM C131	Resistance to Degradation of Small-Size Coarse Aggregate
	by Abrasion and Impact in the Los Angeles Machine
ASTM C143	Slump of Hydraulic Cement Concrete
ASTM C150	Portland Cement
ASTM C172	Sampling Freshly Mixed Concrete
ASTM C173	Air Content of Freshly Mixed Concrete by the Volumetric
	Method
ASTM C231	Air Content of Freshly Mixed Concrete by the Pressure
	Method
ASTM C260	Air-Entraining Admixtures for Concrete
ASTM C309	Liquid Membrane-Forming Compounds for Curing
	Concrete
ASTM C494	Chemical Admixtures for Concrete
ASTM C535	Resistance to Degradation of Large-Size Coarse Aggregate
	by Abrasion and Impact in the Los Angeles Machine
ASTM C618	Coal Fly Ash and Raw or Calcined Natural Pozzolan for
	Use as a Mineral Admixture in Concrete
ASTM C881	Epoxy-Resin-Base Bonding Systems for Concrete

1.4 SUBMITTALS

Submittals shall be in accordance with Section 01300.

A. GENERAL

The submittal for each included concrete mix shall include, as a complete package, the following as defined below:

- 1. Concrete Mix Design
- 2. Certified Test Results
- 3. Sieve Analysis
- 4. Product Data

An incomplete concrete mix submittal package may render a rejection of the mix or could delay the review process.

B. CONCRETE MIX DESIGN

Submit mix design for the proposed mix to be used on the Project, indicating components, and proportions by weight, including any admixtures. Mix design shall state chloride content. Mix designs to be provided are:

- 1. Unspecified Concrete for Liquid Containment Structures
- 2. Unspecified Concrete
- 3. Lean Concrete
- 4. Cement Grout

C. CERTIFIED TEST RESULTS

Submit laboratory test results indicating compressive strength of concrete in compliance with requirements specified herein and in accordance with ACI 301.

D. SIEVE ANALYSIS

Submit sieve analysis for proposed coarse and fine aggregates indicating components, source, gradation, and WSDOT aggregate source approval report, including WSDOT Aggregate Source ID.

E. PRODUCT DATA

Provide product data on all proposed admixtures, accessories, and embedded items to be used on the Project, including, but not limited to:

- 1. Cement; source and type
- 2. Air Entraining Agent
- 3. Water Reducing Admixtures
- 4. Pozzolans
- 5. Bonding Agents
- 6. Curing Compounds/Floor Hardeners
- 7. Non-Shrink Grout; Non-metallic and Metallic

- 8. Waterstops
- 9. Plastic Joint Formers
- 10. Vapor Barriers

For admixtures other than those proposed for air entrainment, submit a letter from the manufacturer describing the benefits of its use for the project and effect of its use on the properties of the concrete. Product data shall expressly state admixtures are chloride free, or the manufacturer shall submit a letter certification stating the same.

F. MATERIAL DELIVERY TICKETS

Provide copies of all concrete and grout material delivery tickets for the Project to the Engineer.

1.5 QUALITY ASSURANCE

Perform work in accordance with ACI 301. Acquire cement and aggregates from same source for all work performed on the Project. Conform to ACI 305 when concreting during hot weather. Conform to ACI 306 when concreting during cold weather. Provide or coordinate field and laboratory testing as described later in this Section and under provisions of Section 01400.

1.6 COORDINATION

Coordinate work in accordance with provisions of Section 01310. Coordinate the placement of embedded items with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. FORMS FOR EXPOSED FINISH CONCRETE

Plywood, metal, metal-framed plywood faced, or other acceptable paneltype materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on the Plans.

B. FORMS FOR UNEXPOSED FINISH CONCRETE

Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. FORM COATINGS

Provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

D. FORM TIES

Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units, which will leave no metal closer than 1-1/2 inches to surface. Unless noted otherwise on Plans, provide ties with plastic cone devices which, when removed, will leave holes not larger than 1-inch diameter in concrete surface.

2.2 CONCRETE MATERIALS

A. CEMENT

ASTM C150, Type II – Moderate or Type I - II. Use one brand of cement throughout the project, unless otherwise approved by the Engineer. Provide low alkali cement where Alkali-Silica Reaction (ASR) mitigation measures are required by WSDOT Aggregate Source Approval.

B. FINE AND COARSE AGGREGATES

Comply with ASTM C33. Provide aggregates from a single source. Coarse aggregate shall be size designation 467 (Nominal size 1-1/2 inch to No. 4 sieve) for all liquid containing structures, and size designation 67 (Nominal size 3/4-inch to No. 4 sieve) for all other concrete. Aggregates shall show a loss of weight not exceeding 35 percent after 500 revolutions in a Los Angeles wear machine, when tested in accordance with ASTM C131 or ASTM C535. Aggregates shall be from a WSDOT approved source.

Coarse aggregate will be the largest nominal size permitted by ACI 301/318.

C. WATER

Clean, potable, and not detrimental to concrete, in compliance with ASTM C94.

2.3 ADMIXTURES

Except for air entrainment, use of all other admixtures used shall be subject to approval of the Engineer and at no additional cost to the Owner. Only admixtures expressly stated by the manufacturer as being chloride-free shall be used. Subject to compliance with requirements, products, which may be incorporated into the work include, but are not limited to, the following:

A. AIR ENTRAINMENT

ASTM C260 certified by manufacturer to be compatible with other proposed admixtures.

Master Builders MB AE 90 or MICRO-AIR Sika AER W.R. Grace Daravair or Darex Series

B. WATER REDUCING ADMIXTURE

ASTM C494 Type A.

Master Builders PolyHeed Sika Plastocrete 161 W.R. Grace WRDA Series

C. ACCELERATING ADMIXTURE

ASTM C494 Type C.

Master Builders Pozzolith NC534 Sika Plastocrete 161 FL W.R. Grace Polarset or DCI

D. WATER REDUCING, RETARDING ADMIXTURE

ASTM C494, Type D.

Master Builders Pozzolith 100XR Sika Plastiment W.R. Grace Daratard Series

E. WATER REDUCING, ACCELERATING ADMIXTURE

ASTM C494, Type E.

Euclid Chemical Co. Accelguard 80 Master Builders Pozzutec 20 W.R. Grace Daraccel

F. HIGH RANGE WATER REDUCER (HRWR)

ASTM C494, Type F.

Master Builders Rheobuild 1000/3000 FC Sika Sikament 10 ESL W.R. Grace ADVA 100

G. HIGH RANGE WATER REDUCER AND RETARDER

ASTM C494, Type G.

Master Builders Pozzolith 440N W.R. Grace Daracem-100

H. POZZOLAN

ASTM C618 - CLASS F, with a CaO maximum content of 10 percent.

2.4 ACCESSORIES

A. BONDING AGENT

ASTM C881, Type I and II, Grade 2, Class C, Epoxy Resin. Subject to Contract requirements, provide one of the following or equal:

Sika Armatec 110 Conspec SpecBond 100 W.R. Meadows Sealtight Rezi Weld 1000

Mason County PUD No. 1
Manzanita Reservoir and Booster Pump Station
G&O #22260 03300-7 - Cast-In-Place Concrete

B. CURING COMPOUND/CHEMICAL FLOOR HARDENER

ASTM C309, Type I, Class A and B. Subject to Contract requirements, provide one of the following or equal:

W.R. Meadows Sealtight 1100-Clear Conspec RX cure Chemrex, Inc. Masterkure Burke Spartan-Cote WB

C. GENERAL PURPOSE NON-SHRINK NON-METALLIC GROUT

Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi (17 Mpa) in 48 hours and 7,000 psi (48 Mpa) in 28 days. Subject to Contract requirements, provide one of the following or equal:

Sika SikaGrout 212 Conspec 100 Non Metallic Chemrex, Inc. Masterflow 928 Grout W.R. Meadows Sealtight 588

D. WATERSTOPS

Provide waterstop of type and size at construction joints and other joints as indicated on the Plans.

1. PVC (Polyvinyl Chloride)

Serrated (ribbed), 3/8 of an inch minimum thickness for 6 inches and larger and 3/16 of an inch minimum thickness for 4 inches. Comply with Corps of Engineers CRD-C-572. No reclaimed PVC will be allowed in waterstop.

Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include, but are not limited to, the following:

Greenstreak Vinylex Corporation W.R. Meadows

2. Cold Joint Waterstop

Install where shown on the Plans or at locations approved by the Engineer. Cold joint waterstop shall be certified by the manufacturer to be compatible for use in wastewater (sewage) containment structures. Unless otherwise shown in the Plans, size shall be 1-inch thick and 1-inch wide.

Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include, but are not limited to, the following:

Hydrotite, Greenstreak

E. PLASTIC JOINT FORMER

Provide and install, per manufacturer's recommendations, where shown on the Plans or at locations approved by the Engineer. Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include, but are not limited to, the following:

Greenstreak Vinylex Corporation W.R. Meadows

F. VAPOR BARRIER

Six-mil fabric reinforced plastic film.

2.5 CONCRETE MIX

A. GENERAL

Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use an independent testing facility acceptable to the Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as that used for field quality control testing.

The maximum water soluble chloride ion content, expressed as a percent of the cement, contributed from all ingredients of the concrete mix, including water, aggregates, cementitious materials, and admixtures, shall not exceed 0.10 percent. Pozzolans may be counted as part of the total cementitious material in the concrete mix design. The cementitious

material is the "minimum cement content" specified in the mix design for each type of concrete. When pozzolans are used as part of this "cement content," the minimum content shall be 15 percent by weight of the total cementitious materials (Portland cement and pozzolans) and not more than 20 percent.

Where ASR mitigation measures are required by WSDOT, provide a minimum of 15 percent pozzolan included in the cementitious material in the design mix.

B. MIX DESIGNS

Provide normal weight concrete with the following properties, unless noted otherwise on the Plans.

1. Unspecified Concrete for Liquid Containment Structures

Structural concrete of general use in liquid containment structures.

Minimum compressive strength @ 28 days: 4,000 psi
Minimum cement content: 6 sacks per cubic yard
Maximum water cement ratio by weight: 0.45
Nominal coarse aggregate size: 1-1/2" to No. 4
(size designation 467)

2. Unspecified Concrete

Structural concrete of general use in structures, sidewalks, and where no specific class of concrete is designated.

Minimum compressive strength @ 28 days: 3,500 psi
Minimum cement content: 5.5 sacks per cubic yard
Maximum water cement ratio by weight: 0.45
Nominal coarse aggregate size: 3/4" to No. 4
(size designation 67)

3. Lean Concrete

Concrete for pipe thrust blocks or for use as noted as "Concrete Fill" on the Plans.

Minimum compressive strength @ 28 days: 2,500 psi Minimum cement content: 5 sacks per cubic yard

4. Cement Grout

Material for filling guard posts, grouting of clarifier bottoms or for other uses as shown on the Plans. Cement grout shall be sand and cement only and shall not contain coarse aggregate.

Minimum compressive strength @ 28 days: 2,500 psi Minimum cement content: 6.5 sacks per cubic yard Maximum water cement ratio by weight: 0.54

C. ADMIXTURES

1. Air Entrainment

Use air-entraining admixture complying with ASTM C260 in all exterior exposed concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement in accordance with ASTM C173 or C231 having total air content with a tolerance of plus or minus 1 percent within the following limits:

5.5 percent for 1.5 inch max. coarse aggregate size 6.0 percent for 1.0 inch max. coarse aggregate size 7.0 percent 0.50 inch or less max. coarse aggregate size

2. Other Admixtures

Use of all other admixtures shall be subject to the approval of the Engineer, and shall be in accordance with ACI 212.3 and Manufacturer's recommendations. Only admixtures stated by the manufacturer to be chloride free shall be used.

D. SLUMP LIMITS

Proportion and design mixes to result in concrete slump (1 inch \pm of the maximum) at the point of placement in accordance with ASTM C143 as follows:

Ramps, slabs, and sloping surfaces: 3 inches.

Reinforced foundation systems: 3 inches.

Other concrete: 4 inches.

Concrete containing HRWR admixture (super-plasticizer): Not more than 8 inches after addition of HRWR to site-verified 2- to 3-inch slump concrete.

Mason County PUD No. 1
Manzanita Reservoir and Booster Pump Station
G&O #22260 03300-11 - Cast-In-Place Concrete

E. CONCRETE MIXING

Comply with requirements of ASTM C94, and as herein specified.

During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than that specified in ASTM C94 may be required.

PART 3 EXECUTION

3.1 GENERAL

Coordinate the installation of joint materials and vapor barriers with placement of forms and reinforcing steel.

3.2 FORMS

Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the work. Use selected materials to obtain required finishes. Solidly butt joints and provide back up at all joints to prevent leakage of cement paste.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast-in-place concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Provide Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete.

Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

Chamfer all exposed corners and edges and other areas shown on the Plans, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

3.3 JOINTS AND WATERSTOPS

A. CONSTRUCTION JOINTS

Locate and install construction joints where indicated, or locate so as not to impair strength and appearance of the structure, as acceptable to the Engineer. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise shown on the Plans.

B. WATERSTOPS

Provide waterstops in construction joints of all water containment structures and where shown on the Plans. Install waterstops to form continuous diaphragm in each joint in accordance with manufacturer's recommendations. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions and recommendations. All waterstops shall be tied into place using hog rings and/or tie wire to keep the waterstop from moving during placement of concrete. Provide manufacturer's written warranty for all waterstop installations.

C. ISOLATION JOINTS IN SLABS-ON-GRADE

Unless otherwise noted, construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as shown on the Plans.

Joint filler and sealant materials are specified in Division 7.

D. SLAB (CONTROL) JOINTS

Construct joints in slabs-on-grade as shown on the Plans. Use saw cuts 1/8 of an inch wide x 1/4 of the slab depth or inserts 1/4-inch wide x 1/4 of the slab depth.

E. PREMOLDED (CONTROL) JOINTS

Insert premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

F. EDGE FORMS AND SCREED STRIPS FOR SLABS

Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.4 INSTALLATION OF EMBEDDED ITEMS:

A. GENERAL

Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use installation drawings, diagrams, instructions, and directions provided by suppliers of items to be embedded.

B. CLEANING AND TIGHTENING

Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

C. REGLETS

Install reglets to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashing as shown at lintels, relieving angles, and other conditions.

3.5 VAPOR BARRIER INSTALLATION

Following leveling and tamping of granular base material for slabs on grade, place vapor barrier sheeting with longest dimension parallel with direction of concrete placement.

Lap joints a minimum of 6 inches and seal with appropriate approved tape. After placement of vapor barrier, cover with sand material and compact to depth as shown on the Plans.

3.6 PLACING REINFORCEMENT

See Section 03200.

3.7 PREPARATION OF FORM SURFACES

Clean reused forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

Thin form coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.8 CONCRETE PLACEMENT

A. GENERAL

Comply with ACI 304 and as herein specified.

Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Apply temporary protective covering to lower 2 feet of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during concrete placement.

B. PLACING CONCRETE IN FORMS

Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

C. PLACING CONCRETE SLABS

Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Maintain reinforcing in proper position during concrete placement operations.

D. COLD WEATHER PLACING

Protect concrete work from physical damage or reduced strength, which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F (27 degrees C) at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

E. HOT WEATHER PLACING

When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is at Contractor's option.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed. Upon approval, water-reducing retarding admixture (Type D) may be used when required by high temperatures, low humidity, or other adverse placing conditions.

3.9 FINISH OF FORMED SURFACES

Provide smooth form finish for all formed concrete surfaces exposed-to-view including all surfaces exposed to water or wastewater, or that are to be covered with a coating material applied directly to the concrete, or a covering material applied directly to concrete, such as veneer plaster, painting, or other similar type of system.

Provide smooth form finish for surfaces to be waterproofed or dampproofed. Surfaces must comply with recommendations of the manufacturer of the product being utilized.

Provide rough form finish for formed concrete surfaces not exposed-to-view in the finished work or by other construction, unless otherwise indicated.

A. SMOOTH FORM FINISH

This is to be the as-cast concrete surface obtained utilizing selected form facing material, arranged orderly and symmetrically with a minimum of seams, and as specified herein.

Repair and patch tie holes and defective areas, with all fins or other projections completely removed and smoothed, by one of the following methods:

- 1. Provide smooth rubbed finish to concrete surfaces after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
- 2. Provide grout "sacked" cleaned finish. The sacking grout shall be one part Portland cement to 1-1/2 parts fine sand by volume, and mixed with water to consistency of thick paint. Proprietary additives such as epoxy bonding agents or adhesives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts to be determined by trial patches, so that final color of dry grout matches adjacent surfaces. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep sacked surfaces damp by fog spray or other acceptable method so surfaces do not dry out.

B. ROUGH FORM FINISH

This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/8 of an inch in height rubbed down or chipped off. All "bug holes" exceeding 1/2 inch in diameter and exceeding 1/4-inch depth shall be repaired or filled in.

C. RELATED UNFORMED SURFACES

At tops of walls, horizontal offsets, and similar unformed surfaces occurring at adjacent formed surfaces, continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

D. TOLERANCES FOR FORMED SURFACES

- 1. Variations from the plumb:
 - a. In the lines and surfaces of columns, pier, walls and in arises

In any 10 feet of length – 1/4 inch. Maximum for entire length – 1 inch

b. For exposed corner columns, control-joint grooves, and other conspicuous lines

In any 20 feet of length – 1/4 inch. Maximum for entire length – 1/2 inch

- 2. Variations from level or from the grades indicated on the Plans:
 - In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores

In any 10 feet of length - 1/4 inch. In any bay or opening, or in any 20 feet of length - 3/8 of an inch. Maximum for entire length - 3/4 inch

b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines

In any bay or opening, or in any 20 feet of length – 1/4 inch.

Maximum for entire length – 1/2 inch

3. Variations in the linear building lines from the established position in plan view

In 20 feet of length – 1/2 inch. Maximum for entire length – 1 inch

4. Variations in distance between walls, columns and partitions

In any 10 feet of distance – 1/4 inch. In any bay or opening – 1/2 inch. Maximum total variation – 1-inch.

5. Variations in the sizes and locations of sleeves, floor openings and wall openings

 $\begin{array}{l} Minus-1/4 \ inch \\ Plus-1/2 \ inch \end{array}$

6. Variations in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls

Minus -1/4 inch Plus -1/2 inch

7. Variations in footings:

a. Variation from dimensions on Plans when formed or plus 3-inches when placed against unformed excavations

Minus -1/2 inch Plus -2 inches

b. Misplacement of eccentricity

2 percent of the footing width in the direction of the misplacement, but not more than 2 inches

c. Reduction in thickness of specified thickness

Minus - 5 percent

3.10 MONOLITHIC SLAB FINISHES:

A. FLOAT FINISH

Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. TROWEL FINISH

Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks and uniform in texture and appearance. Grind smooth surface defects that would telegraph up through applied floor covering system.

C. TROWEL AND FINE BROOM FINISH

Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

D. NON-SLIP BROOM FINISH

Apply non-slip broom finish to exterior concrete platforms, landings, steps, and ramps, sidewalks and elsewhere as indicated. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Owner before application.

E. CHEMICAL-HARDENER FINISH

Apply chemical-hardener finish to interior exposed concrete floors and steps, unless noted otherwise. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Evenly apply each coat, and allow 24 hours for drying between coats. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

F. TOLERANCES FOR MONOLITHIC SLAB FINISHES

The flatness of the concrete shall be carefully controlled and the tolerances shall be measured by the straight edge system as specified in paragraph 4.5.7 of ACI 117, using a 10-foot straight edge, within 72 hours after floor slab installation and before shores and/or forms are removed. The listed tolerances shall be met at any and every location at which the straight edge can be placed.

Bullfloated 1/2 inch Float Finish 3/16 inch Trowel Finish 1/8 inch Straightedges 5/16 inch

3.11 CONCRETE CURING AND PROTECTION

A. GENERAL

Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep concrete continuously wet for not less than 7 days. Begin final curing procedures immediately following initial curing and before concrete has dried out. Continue final curing for at least 7 days in accordance with ACI 301 curing methods. Avoid rapid drying of concrete at the end of final curing period.

B. CURING METHODS

Perform curing of concrete by use of curing and sealing compound, by moist curing, by moisture-retaining cover curing, or by combinations thereof, as herein specified.

Provide moisture curing by the following methods. Keep concrete surface continuously wet by covering with water, or provide continuous water-fog spray.

Covering concrete surface with absorptive cover, thoroughly saturating cover with water and keeping continuously thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

Provide moisture-cover curing as follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in wide as practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walls, sidewalks, and curbs, as follows:

Apply curing and sealing compound to concrete slabs and walls as soon as initial curing operations are complete or immediately after the forms have

been stripped (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Completely cover the concrete surfaces with curing and sealing compound. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair any damage during curing period.

Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to the Engineer.

C. CURING FORMED SURFACES

Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period and until forms are removed. When forms are removed, continue curing by methods specified above, as applicable.

D. CURING UNFORMED SURFACES

Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of an appropriate curing method.

Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture retaining cover.

3.12 SHORES AND SUPPORTS

A. GENERAL

Comply with ACI 347 for shoring, and as herein specified. Extend shoring from ground to roof for structures four stories or less, unless otherwise permitted. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.

Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until all concrete has attained its required 28 day strength and heavy loads due to construction operations have been removed.

B. REMOVAL OF FORMS

Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

Formwork supporting weight of concrete, such as beam soffits, joints, suspended slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained 70 percent of the design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens, representative of concrete location or members.

Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.13 REUSE OF FORMS

Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Provide new form facing material. Apply new form coating compound as specified for new formwork prior to reuse of forms.

When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, unless approved by the Engineer and acceptable to the Owner.

3.14 MISCELLANEOUS CONCRETE ITEMS

A. FILLING-IN

Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work. Fill-in all form tie holes and other forming system holes with non-shrink grout.

B. CURBS

Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. BASE PLATE, EQUIPMENT BASES AND FOUNDATIONS

Provide machine and equipment bases (housekeeping pad/pier) and foundations, as shown on the Plans. Set anchor bolts for machines and equipment with template at correct elevations, complying with certified diagrams or templates of manufacturers furnishing machines and equipment.

Provide 4-inch-high, square or rectangular concrete pad around all conduits and small diameter pipes that penetrate through floor slabs.

Provide leveling grout under base plates and equipment frames using non-metallic, non-shrink grout. Minimum thickness for leveling grout shall be 1/2 inches unless noted otherwise on the Plans or specified by equipment manufacturer.

3.15 CONCRETE SURFACE REPAIRS

A. PATCHING DEFECTIVE AREAS

Repair and patch defective areas immediately after removal of forms. Cut out honeycomb, rock pockets, voids or bugholes over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. For water and wastewater containment structures, utilize an epoxy resin bonding agent. Place patching mortar after bonding compound has dried.

For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. REPAIR OF FORMED SURFACES

Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, bug holes, honeycomb, rock pockets; fins and other discolorations that cannot be removed by cleaning. Flush out form tie holes and form bolt holes, fill with non-shrink grout, or precast concrete cone plugs or rubber plugs secured in place with bonding agent or epoxy adhesive.

Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. All repairs shall be approved by the Engineer. If defects cannot be repaired, the Contractor shall remove and replace the concrete.

C. REPAIR OF UNFORMED SURFACES

Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

Repair finished unformed surfaces that contain defects, which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01 inches wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Engineer.

Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3 inches of clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cutout holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

Perform structural repairs with prior approval of the Engineer for method and procedure, using specified epoxy adhesive and mortar. Repair methods not specified above may be used, subject to approval of the Engineer. If acceptable repairs cannot be made, the Contractor shall remove and replace the concrete at no cost to the Owner.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. GENERAL

Sampling and testing for quality control during placement of concrete shall include the following:

1. Sampling Fresh Concrete

ASTM C172, except modified for slump to comply with ASTM C94.

2. Slump

ASTM C143: one test at point of discharge for each day's placement of each type of concrete; additional tests when concrete consistency seems to have changed.

3. Air Content

ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's placement of each type of airentrained concrete.

4. Concrete Temperature

Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens is made.

5. Compression Test Specimen

ASTM C31; one set of four standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

6. Compressive Strength Tests

ASTM C39; one set for each day's placement exceeding 5 cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any 1 day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

When total quantity of a given class of concrete is less than 50 cubic yards, Engineer may waive strength test if, in their judgment, adequate evidence of satisfactory strength is provided.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the inplace concrete. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

Test results will be reported in writing to Engineer and Contractor within 24 hours after testing. FAX of test results is acceptable; however, mailing hard copies of test results is also required. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7 day tests and 28-day tests.

7. Nondestructive Testing

Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection of concrete.

8. Additional Tests

The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in a structure, as directed by the Owner. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for cost of such tests when unacceptable concrete is verified.

3.17 WATERTIGHTNESS

Comply with Section 13212.

*** END OF SECTION ***

DIVISION 6 WOOD AND PLASTICS

SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section shows the extent of rough carpentry work on the Plans, including, but not limited to, the following: wood framing, timber posts and beams, rooftop equipment bases and support curbs, wood nailers and blocking, wood furring, fascia, soffits, and sheathing.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals

1.3 REFERENCES

This Section references the latest revisions of the following documents:

Reference	<u>Title</u>
ALSC PS 20	American Lumber Standards Committee (ALSC):
	American Softwood Lumber Standard
APA PRP-108	American Plywood Association (APA): Performance
	Standards and Qualification Policy for Structural-Use
	Panels
APA PS 1	American Plywood Association (APA): Product Standard
	for Construction and Industrial Plywood
ASTM A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM D226	Asphalt-Saturated Organic Felt Used in Roofing and
	Waterproofing
AWC NDS	American Wood Council (AWC): National Design
	Specification for Wood Construction
AWC WFCM	American Wood Council (AWC): Wood Frame
	Construction Manual for one- and two-family dwellings
AWPA U1	American Wood-Preservers' Association (AWPA)
	Standard
WCLIB 17	West Coast Lumber Inspection Bureau (WCLIB): Standard
	Grading and Dressing Rules for Douglas Fir, Western
	Hemlock, Western Red Cedar, White Fir, Sitka Spruce
	Lumber

1.4 SUBMITTALS

Comply with provisions of Section 01300.

Submit a certificate of compliance from the supplier certifying that the materials provided meet or exceed specified requirements. Certificate shall itemize materials provided on the Project and refer to pertinent specifications.

1.5 DELIVERY, STORAGE AND HANDLING

Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and underneath temporary coverings including polyethylene and similar materials. For lumber and plywood that is pressure treated with waterborne chemicals, provide a sticker between each course to provide air circulation.

PART 2 PRODUCTS

2.1 GENERAL

Lumber shall comply with ALSC PS 20 and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

Each piece of lumber shall be factory marked with Grade Stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill that produced the product.

Nominal sizes are indicated on the Drawings, except as shown by detailed dimensions. Provide actual sizes as required by ALSC PS 20, with moisture content specified for each use.

Provide dressed lumber, S4S, unless otherwise indicated. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.2 FRAMING LUMBER AND FASCIA BOARDS

Unless noted otherwise, provide Douglas Fir - Larch No. 2 or better, or Hem-Fir No. 1 or better.

2.3 BEAMS, STRINGER, POSTS AND TIMBERS

Unless noted otherwise on the Plans, provide Douglas Fir - Larch No. 1 or better. Glue Laminated Lumber: Douglas Fir, coast region. Bottom lamination shall be free of unsound knots or defects larger than 1/2-inch diameter. Provide industrial Appearance Grade. Each member shall bear the American Institute of Timber Construction (AITC) stamp. See Drawings for additional requirements.

2.4 TRIM BOARDS

Unless noted otherwise, provide No. 2 Common Boards or better complying with WWPA rules. Where boards are exposed to finish work, provide 19 percent maximum moisture content. Exterior trim shall be cedar, Grade A or better.

2.5 MISCELLANEOUS LUMBER

Provide wood for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, wood trim, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown or required. Provide Standard Grade Hem-Fir or better. Provide 19 percent maximum moisture content for lumber items not specified to receive wood preservative treatment.

2.6 SHEATHING

Provide APA-rated Exposure 1 unless noted otherwise, span rating and thickness as noted on the Plans.

Comply with PS 1 "Product Standard for Construction and Industrial Plywood" for plywood panels and for products not manufactured under PS 1 provisions, comply with APA PRP-108. Factory-mark each panel with APA trademark evidencing compliance with grade requirements.

2.7 PLYWOOD OTHER THAN SHEATHING

A. BACKING PANELS

For Plywood Backing Panels (or Boards) used for mounting electrical, telephone or communications system equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated on the Drawings. If not otherwise indicated, provide minimum thickness of 15/32 of an inch.

B. SOFFITS

APA A-C Exterior, Exposure 1, thickness as indicated on the Plans, 1/2 inch minimum.

C. SIDING

APA-rated siding - 303; exterior thickness, texture and pattern as indicated on the Plans.

D. MARINE

APA, A-A exterior thickness as indicated on the Plans. HDO (High Density Overlay) faces are acceptable.

2.8 MISCELLANEOUS MATERIALS

A. FASTENERS AND ANCHORAGES

Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable federal specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended fasteners.

Where rough carpentry work is exposed to the weather, in ground contact, or in an area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating per ASTM A153.

B. BUILDING PAPER

ASTM D226, Type I; asphalt saturated felt, non-perforated, 30-lb. type.

C. SILL SEALER GASKETS

Glass fiber resilient insulation fabricated in strip form for use as a sill sealer; 1-inch nominal thickness compressible to 1/32 of an inch; selected from manufacturer's standard width to suit width of sill members.

2.9 WOOD TREATMENT BY PRESSURE PROCESS

Where lumber or plywood is indicated as "P.T." or "Treated," or is specified herein to be treated, comply with applicable requirements of American Wood Preserver's Association (AWPA) Standard U1.

Pressure-treat above-ground items with waterborne preservatives to comply with AWPA Standard U1. After treatment, kiln dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Pressure treat items indicated on the Plans and all of the following: wood cants, nailer, curbs, top plates, equipment support bases, equipment curbs, plywood, blocking, stripping, and similar members utilized in connection with roofing, flashing, vapor barriers and waterproofing. All wood items including plywood used for or around roof penetrations shall be pressure treated.

PART 3 EXECUTION

3.1 GENERAL

Discard units of material with defects that could impair the quality of the work or with units too small to use in fabricating work with minimum joints or optimum joint arrangement. Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, and similar supports to allow attachment of other work.

Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.

Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD NAILERS AND BLOCKING

Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 WOOD FURRING

Install plumb and level with closure strips at edges and openings. Shim with wood as required to obtain specified tolerance for finished work.

A. FURRING FOR PLYWOOD PANELING

Unless otherwise indicated, provide 1-inch x 3-inch furring at 2 feet on center, horizontally and vertically. Select furring for freedom from knots capable of producing bent over nails and resulting damage to paneling.

B. FURRING FOR GYPSUM DRYWALL

Unless otherwise indicated, provide 1-inch x 2-inch furring at 16-inch on center, vertically.

C. SUSPENDED FURRING

Provide size and spacing shown, including hangers and attachment devices. Level to a tolerance of 1/8 inch in 10 feet.

3.4 WOOD FRAMING, GENERAL

Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of the AWC WFCM. Do not splice structural members between supports. Anchor and nail as shown, and to comply with the AWC NDS.

Firestop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where firestops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2—inch-thick lumber of the same width as framing members.

3.5 STUD FRAMING

Provide stud framing of size and spacing indicated or, if not otherwise indicated, of the following sizes and spacings. Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using 2-inch-thick members with widths equaling that of studs. Nail or anchor plates to supporting construction.

Unless noted otherwise, provide the following minimum framing:

- 1. For exterior walls provide 2" x 6" wood studs spaced 24-inches on center.
- 2. For interior partitions and walls provide 2" x 4" wood studs spaced 16-inches on center.

Construct corners and intersections with not less than three studs. Provide miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items and trim.

Provide continuous horizontal blocking row at mid-height of walls and partitions 8 feet high and greater, using 2-inch-thick members of same width of wall or partitions.

Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

For non-bearing partitions, provide double-jamb studs and headers not less than 4-inches deep for openings 3 feet or smaller in width, and not less than 6-inches deep for wider openings.

For load-bearing partitions, provide double-jamb studs for openings 6 feet or smaller in width, and triple-jamb studs for wider openings. Provide headers of depth shown.

Provide diagonal bracing in stud framing of exterior walls, except as otherwise indicated. Brace both walls at each external corner, full story height, at a 45-degree angle, using either a let-in 1" x 4" or 2" x 4" blocking or metal diagonal bracing. Omit bracing where plywood sheathing, siding and/or gypsum wallboard are indicated to be provided.

3.6 FLOOR AND ROOF JOIST FRAMING

Provide framing of sizes and spacings shown. Install with crown edge up and support ends of each member with not less than 3 inches of bearing on wood or metal, or masonry. Attach to wood bearing members by toe nailing or metal connectors; frame to wood supporting members with metal framing connectors. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 4 feet. Do not notch in middle third of joists; limit notches to 1/6 depth of joist, 1/3 at ends. Do not bore holes larger than 1/3 depth of joist or locate closer than 2 inches from top or bottom. Provide solid blocking (2-inches thick by depth of joist) at ends of joists unless flush framed to supporting member.

At interior supports, for end bearing of 4 inches (nominal) or less, lap members framing from opposite sides of support (beams, girders or partitions) not less than 6 inches or securely tie opposing members together with strap tie. Provide solid blocking (2-inches thick by depth of joist) over supports.

Provide solid blocking between joists under jamb studs of partition walls and/or, provide double joists separated by solid blocking under partition walls.

Provide bridging between joists where nominal depth-to-thickness ratio exceeds 4, at intervals not to exceed 8 feet max. Use bevel-cut 1" x 4" or 2" x 4" wood bracing, double-crossed and nailed both ends to joists, or use solid wood bridging 2-inch thick by depth of joist, end-nailed to joist.

3.7 RAFTER AND CEILING JOIST FRAMING

A. CEILING JOISTS

Provide member size and spacing shown, and as previously specified for floor joist framing. Face nail to ends of parallel rafters.

Where principal ceiling joists are at right angle to rafters, frame as indicated with additional short joists from wall plate to first joist at spacing equal to principal ceiling joists; nail to ends of rafters and to top plate and to principal ceiling joists.

B. RAFTERS

Provide member size and spacing shown. Notch to fit exterior wall plates and toe nail or use special metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing (if any), and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

At valleys, provide valley rafter of size shown, or if not shown, provide rafter twice as thick as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafter.

At hips, provide hip rafters of size shown, or if not shown, provide of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafters.

Provide collar beams (ties) as shown, or if not shown, provide 1" x 6" boards between every third pair of rafters. Locate below ridge member, 1/3 of distance to ceiling joists. Cut ends to fit slope and nail to rafters. Provide special framing as shown for eaves, overhangs, dormers, and similar conditions, if any.

3.8 TIMBER FRAMING

Provide wood beams and girders of the size and spacing shown. Install with crown edge up and provide not less than 4-inch bearing on supports. Provide continuous members unless shown; tie together over supports if not continuous.

Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space between sides and ends of wood members and supporting wall. Five-quarter cut members built into masonry construction.

Where built-up beams or girders of nominal 2-inch dimension lumber on edge are shown, fasten together with two rows of 16d nails spaced not less than 16-inches on center. Locate one row near top edge and other near bottom edge. Locate end joints in members over supports; for continuous members, stagger ends at quarter points between supports.

Provide wood posts of the sizes shown. Provide metal anchoring and attachment devices as shown.

3.9 INSTALLATION OF SHEATHING

A. GENERAL

Comply with applicable recommendations contained in the APA "Engineered Wood Construction Guide," for types of construction panels and applications indicated.

B. FASTENING METHODS

Fasten panels as indicated on the Plans. Include metal H clips between sheathing panels.

C. PLYWOOD BACKING PANELS

Nail to supports with minimum 10d at 6-inches on center edge nailing and 12-inches on center at intermediate framing.

*** END OF SECTION ***

DIVISION 7 THERMAL AND MOISTURE PROTECTION

SECTION 07210

BATT AND RIGID INSULATION

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the furnishing of all labor, materials, tools, and equipment required to install batt and rigid insulation, as indicated on the Plans and as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
06190	Prefabricated Wood Trusses

1.3 REFERENCES

This Section references the latest revisions of the following document:

Reference ASTM C578	<u>Title</u> Standard Specification for Rigid, Cellular
	Polystyrene Thermal Insulation
ASTM C665	Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C1289	Standard Specification for Faced Rigid, Cellular Polyisocyanurate Thermal Insulation Board
ASTM C1320	Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

1.4 PERFORMANCE REQUIREMENTS

Materials of this Section shall provide continuity of thermal and vapor and air barriers at building enclosure elements.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

Owens Corning, Johns Manville, CertainTeed, DOW, or approved equal.

2.2 MATERIALS

A. BATT INSULATION

Type III preformed, foil-faced, glass fiber batt or roll conforming to ASTM C665, to the thicknesses needed to meet the R-values shown on the Plans and as required by code.

B. RIGID ROOF INSULATION

Type 1, Class 1 rigid, closed cell Polyisocyanurate foam board insulation conforming to ASTM C1289, to the thicknesses needed to meet the R-values shown on the Plans and as required by code.

C. RIGID BELOW-GRADE INSULATION

Type IV rigid, closed cell extruded polystyrene foam board insulation conforming to ASTM C578, to the thicknesses needed to meet the R-values shown on the Plans and as required by code.

D. VAPOR BARRIER

Polyamide (nylon) vapor retarding, 2 mil, sheeting with a variable permeance ranging from 1 perm, or less, up to 10 perms, or greater, based on varying levels of ambient humidity; MemBrain Continuous Air Barrier & Smart Vapor Retarder by Certainteed, or equal.

E. TAPE

Pressure sensitive, aluminum foil tape; Specialty Tape #425 by 3M, or equal.

F. INSULATION FASTENERS

Galvanized steel impale spindles and clips on 2-inch square flat bases with self adhering backing and length to suit insulation thickness. Include galvanized steel retaining washer(s) of not less than 1-1/2-inches in

diameter capable of securely and rigidly fastening insulation in place; by Gemco, or equal.

G. BUILDING WRAP

Mechanically attached water-resistive, vapor permeable air barrier membrane system including primary sheet membrane, self-adhered flashing tape, and flashing primer (as needed). Entire system shall be provided by a single manufacturer. Tyvek CommercialWrap by DuPont, WrapShield IT by VaproShield, or equal.

H. INSULATION BAFFLES

Rigid polystyrene or PVC insulation baffles;Raft-R-Mate by Owens-Corning, AccuVent by Brentwood, or equal.

PART 3 EXECUTION

3.1 EXAMINATION

Verify site conditions before beginning installation. Verify that substrate and adjacent materials are ready to receive insulation, and free of all projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 GENERAL

Comply with insulation manufacturer's written instructions applicable to products and applications.

Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

Extend insulation to envelop entire area to be insulated with vapor barriers placed to face the interior (warm) side of the envelope. Fill all voids with insulation, fit tightly around all obstructions and tight to the exterior side of mechanical and electrical services within the plane of the insulation. Remove projections that interfere with placement. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-values.

All miscellaneous voids shall have insulation installed to prevent gaps in insulation using either fiberglass batt compacted to approximately 75 percent of

normal maximum volume, or spray polyurethane foam applied according to the manufacturer's written instructions.

Prior to installation of finished surfaces, all vapor-retarder joints and ruptures shall be taped and sealed in each continuous area of insulation to ensure an airtight installation.

3.3 INSTALLATION BELOW GRADE

On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions.

Stagger all joints and butt all panels together for tight fit.

3.4 INSTALLATION IN FRAMED CONSTRUCTION

Install blanket insulation in all cavities formed by framing members. Use insulation widths and lengths that fully fill the cavities. If more than one length is required to fill cavities, provide lengths that will produce a snug fit between ends. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members, and lap all ends and side flanges of facings over framing members.

Prior to installation of attic insulation, install eave insulation baffles between roof framing members on the underside of roof sheathing in insulated attic spaces at vented eaves.

For metal-framed wall cavities, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs. For unfaced blankets, located vapor barrier joints over member faces and extend vapor barrier tight to the full perimeter of adjacent window and door frames, as well as other items interrupting the plane of membrane. Fully tape seal in place. Provide airspace at exterior plane of insulation for ventilation as recommended by manufacturer.

For wood-framed wall cavities, install blankets according to ASTM C1320 and as specified herein. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

*** END OF SECTION ***

SECTION 07410

METAL ROOF AND WALL PANELS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes, but is not necessarily limited to, furnishing and installing of all metal roofing, siding, metal fascia, gutters, downspouts, and accessories as indicated on the Plans and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
06190	Prefabricated Wood Trusses

1.3 SUBMITTALS

Submit in accordance with Section 01300 and as specified herein.

A. PRODUCT DATA

Submit manufacturer's technical product data, installation instructions, and recommendations for Metal Roof and Wall Panels used. Include data substantiating that materials comply with requirements.

B. SAMPLES

Prior to ordering products, submit a physical color chart of manufacturer's standard color samples for Owner's selection.

C. SHOP DRAWINGS

Show panel layout, trim installation, and panel attachment. Include gutters and downspouts.

D. WARRANTY

1. Manufacturer's Product Warranty

Manufacturer's standard coating performance warranty, as available for specified installation and environmental conditions.

2. Contractor's Warranty

Warrant panels, flashings, sealants, fasteners, and accessories against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for 2 years following project substantial completion date.

1.4 QUALITY ASSURANCE

A. INSTALLER'S QUALIFICATIONS

Installation of panels and accessories by installers with a minimum of 10-years documented experience in metal panel projects of this nature.

B. MANUFACTURER'S QUALIFICATIONS

Manufacturer shall have a minimum of 10-years experience supplying metal roofing/siding to the region where the work is to be done.

C. REGULATORY AGENCY REQUIREMENTS

Comply with IBC and local Building Code requirements if more stringent than those specified.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

Protect panels against damage and discoloration. Handle panels with non-marring slings and do not bend panels. Store panels above ground, with one end elevated for drainage. Protect panels against standing water and condensation between adjacent surfaces. If panels become wet, immediately separate sheets, wipe dry and allow to air dry. Remove any strippable film prior to installation and do not allow too remain on panels in extreme cold, heat or in direct sunlight.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURER

The Bryer Company, Taylor Metal Products, Metal Sales, or approved equal.

Panel Designation:

Roof: Interlocking standing seam panels with a net coverage of 16 inches and panel surface striations. The Bryer Company TBC-Ultra, or equal.

Soffits: Interlocking hidden fastener, low-profile flush panels with a net coverage of 12 inches and two (2) pencil ribs. Soffit panels shall be perforated with a minimum open area of 11 in2/ft2 of panel. The Bryer Company TBC-Flush, or equal.

2.2 MATERIALS

A. PANELS

1. Base Metal

Steel conforming to ASTM A924/ASTM A792 Grade 40 or ASTM A446 Grade C, thickness 22 gauge.

2. Coatings

Protective zinc coating conforming to ASTM A653, Class G-90.

3. Finish

Exterior finish includes a 0.2 mil thick corrosion-resistant primer and a 0.8 mil thick finish coat of Polyvinylidene Fluoride (PVF₂), full 70 percent Kynar 500®/Hylar 5000® for a total 1.0 mil dry film thickness.

4. Color

Manufacturer's standard selection of not less than 12 colors.

5. Sidelap Sealant

Factory applied butyl sealant at all panel-to panel sealing surfaces.

B. ACCESSORIES

1. Concealed Clips

Galvanized steel conforming to ASTM A653, Class G-90, 16 gauge clips designed to allow thermal movement of panel and configured to secure panel per design conditions.

2. Fasteners

Self-tapping screws, bolts, nuts, and other acceptable fasteners per manufacturer's requirements. Exposed fasteners shall be corrosion-resistant, color-matched with neoprene gasket.

3. Sealants (Field Applied)

Gunnable caulk and tape sealants per Specification Section 07900.

4. Profile Closures

Closed cell foam, die-cut or formed to panel configuration.

5. Trim and Flashing

Material, gauge, and finish to match panels. Profiles shall be as indicated in the Plans and as required to weather seal the structure. Lead or copper flashing is not acceptable for use.

6. Underlayment

Self-adhered ice and water shield conforming to ASTM D1970, per Specification Section 07210.

2.3 GUTTER AND DOWNSPOUT

Provide gutters and downspouts of same material as roof panels. Gutters shall be continuous and seamless, formed from flat sheet. Downspouts are to be rectangular. Fasteners shall be same material and finish as panel, with soft neoprene washers, and anchorage shall conform to SMACNA requirements.

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PART 3 EXECUTION

3.1 EXAMINATION

Contractor shall inspect installed work of other trades and verify that such work is complete to a point where this work may continue. Verify that installation can be performed in accordance with approved shop drawings and manufacturer's instructions.

3.2 PREPARATION

A. FIELD MEASUREMENTS

Verify prior to installation. If field measurements differ from Plan dimensions, notify Engineer prior to fabrication.

B. PROTECTION

Treat, or isolate with protective material, any contacting surfaces of dissimilar materials to prevent electrolytic corrosion, comply with Section 09900. Require workmen who will be walking on roofing panels to wear clean, soft-soled shoes that will not pick up stones or other abrasive material, which could cause damage and discoloration.

C. SURFACE PREPARATION

Clean and dry surfaces prior to applying sealant.

3.3 INSTALLATION

Unless otherwise shown on the Plans or specified herein, fabricate panels in continuous one-piece lengths and fabricate flashings and accessories in longest practical lengths.

Roofing panels shall be factory formed. Field formed panels are not acceptable.

Downspouts anchorage shall conform with SMACNA requirements.

A. PANELS

- 1. Follow metal panel manufacturer's directions and printed instructions.
- 2. Install roof panel seams vertically.

- 3. Install wall panel seams: vertically.
- 4. Lap panels away from prevailing wind direction.
- 5. Do not stretch or compress panel side-lap interlocks.
- 6. Secure panels without warp or deflection.

B. ALLOWABLE ERECTION TOLERANCE

Maximum Alignment Variation: 1/4 inch in 40 feet.

C. FLASHING

- 1. Follow manufacturer's directions and Engineer-approved shop drawings.
- 2. Overlap roof panels at least 6 inches.
- 3. Install flashings to allow for thermal movement.
- 4. Remove any strippable protective film, if used, immediately preceding flashing installation.

D. CUTTING AND FITTING

- 1. Provide neat, square and true. Torch cutting is prohibited where cut is exposed to final view.
- 2. Openings 6 inches and larger in any direction: Shop fabricate and reinforce to maintain original load capacity.
- 3. Where necessary to saw cut panels, debur and treat with galvanic paint coating to match factory color.

3.4 CLEANUP AND CLOSEOUT

A. PANEL DAMAGE AND FINISH SCRATCHES

Do not apply touch-up paint to damaged paint areas that involve minor scratches. Panels or flashings that have severe paint and/or substrate damage shall be replaced as directed by the Engineer.

B. CLEANING AND REPAIRING

At completion of each day's work and at work completion, sweep panels, flashing and gutters clean. Do not allow fasteners, cuttings, filings, or scraps to accumulate. Remove debris from project site upon work completion, or sooner, if directed by the Owner.

*** END OF SECTION ***

SECTION 07900

CAULKING AND SEALANTS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the furnishing of all labor, materials, tools, and equipment required to install caulking and sealants, as indicated on the Plans and as specified herein.

All exterior wall joints and interior and exterior joints between all differing or dissimilar materials and at windows, doors, roof penetrations, louvers and similar types of openings shall receive sealants to make the joint air and watertight. This includes concrete to CMU, concrete to wood, CMU to wood, concrete to sheet metal, CMU to sheet metal, etc.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
04200	Masonry
	<u>-</u>

1.3 REFERENCE STANDARDS

This Section references the latest revisions of the following documents:

Reference AAMA 800	<u>Title</u> Sealant Manual, Specifications and Test Methods for Sealants
ASTM C834	Standard Specification for Latex Sealants
ASTM C920	Standard Specification for Elastomeric Joint Sealants
ASTM C1193	Standard Guide for Joint Sealants
ASTM C1311	Standard Specification for Solvent Release Sealants

ASTM D5249 Standard Specification for Backer Material for Use with

Cold- and Hot-Applied Joint Sealants in Portland-Cement

Concrete and Asphalt Joints

ASTM D7174 Standard Specification for Preformed Closed-Cell

Polyolefin Expansion Joint Fillers for Concrete Paving and

Structural Construction

NSF/ANSI 61 Drinking Water System Components – Health Effects

PART 2 PRODUCTS

2.1 POLYURETHANE SEALANTS

Provide a one-component, gunnable grade, non-sag, solvent-free polyurethane sealant. The sealant shall cure under the influence of atmospheric moisture. Sealant shall meet ASTM C920, Type S, Grade NS, Class 35, under uses NT, T, M, G, I, A, and O. Performance characteristics shall include a 175 psi 21-day tensile strength, a minimum 500-percent ultimate elongation, and a maximum Shore "A" Hardness of 45.

Polyurethane sealants shall be Sikaflex-1a, as manufactured by the Sika Corporation, or equal by Tremco, Inc. or BASF Corporation.

2.2 SILICONE SEALANTS

Provide a one-component, gunnable grade, neutral cure, silicone sealant. Sealant shall meet ASTM C920, Type S, Grade NS, Class 50, under uses NT, M, G, A and O. Performance characteristics shall include a 200 psi 21-day tensile strength, a minimum 700-percent ultimate elongation, and a maximum Shore "A" Hardness of 25.

Silicone sealants shall be Sikasil WS-295, as manufactured by the Sika Corporation, or equal by Tremco, Inc. or BASF Corporation.

2.3 ACRYLIC LATEX CAULK

Provide a one-component, gunnable grade, pure acrylic latex sealant. Sealant shall meet ASTM C834, Type OP, Grade -18 °C. Performance characteristics shall include a maximum 25-percent shrinkage, and a movement capability of plus/minus 12.5-percent.

Acrylic latex sealants shall be Tremflex 834, as manufactured by the Tremco, Inc. or equal by BASF Corporation.

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2.4 TAPE SEALANT

Provide a 100-percent solid, isobutylene preformed sealant tape. Tape sealant shall meet the American Architectural Manufacturer's Association AAMA 807.3 standard. Performance characteristics shall include a density of 1.5 and a minimum peel adhesion of 8 pounds per inch.

Tape sealant shall be Sikalastomer-95, as manufactured by the Sika Corporation, or equal by Tremco, Inc. or BASF Corporation.

2.5 PREFORMED FLEXIBLE JOINT MATERIAL

Provide a closed-cell, polyolefin preformed foam joint material. Foam joint material shall meet ASTM D7174. Performance characteristics shall include an expansion recovery greater than 99-percent, a maximum 50-percent compression strength of 15 psi, and a maximum water absorption of 0.25-percent by volume.

Foam joint material shall be Ceramar, as manufactured by W.R. Meadows, or equal.

2.6 PREFORMED FLEXIBLE JOINT BACKER MATERIAL

Provide a closed-cell, polyolefin preformed foam backer rod material. Backer rod material shall meet ASTM D5249 and shall be compatible with the proposed cold-applied sealant.

Backer rod material shall be Kool-Rod, as manufactured by W.R. Meadows, or equal.

2.7 PRIMERS

Provide primer materials made by or recommended by the sealant manufacturer for the conditions of the application, including the materials to be sealed at the joints and the type of sealant or caulking material to be used.

PART 3 EXECUTION

3.1 GENERAL

All sealant and primer work shall comply with ASTM C1193 and with the manufacturer's written instructions.

The Contractor shall confirm that the proposed sealant and primer materials are compatible with any concrete curing compound used, or the Contractor shall lightly sandblast and thoroughly clean concrete joint surfaces prior to application of sealant materials.

All priming and sealant work shall be done under temperature and moisture conditions that are within the requirements of the manufacturer's written instructions.

All exterior dissimilar materials shall be sealed with elastomeric sealants at the joints between the different materials.

3.2 APPLICATION OF SEALANTS

A. PREPARATION OF JOINTS

Inspect profiles and surfaces of all joints prior to application. Verify joint dimensions are adequate for development of the sealant movement capability. All joints shall be solvent cleaned, dry, and free of dust, oils and grease before receiving backing materials and sealant. Floor joints shall be wire brushed, free of laitance or other residues. Aluminum or other metal surfaces to be in contact with sealants shall be wiped clean with xylol or an MEK solvent to remove any coatings or contamination. Joint sealants shall be installed before other surface finishes are applied. Proceed with joint sealant work only once conditions meet the manufacturer's requirements.

B. BACKINGS

Install filler and backer materials in as long of lengths as practicable. Stretch and force into joints with tool designed for that purpose, to a uniform depth, as indicated on the Plans or as required by the manufacturer, allowing for installation of sealant and caulking. Provide filler material in slab shapes for joints 1/2 inch or more in depth, and in 3/4 inch or more wide joints to receive sealing material. Provide extruded rod backer material in all other joints to receive sealant. Filler or backer material shall be of a depth as required to bring the top surface to within 1/2 inch of the slab surface, or as indicated on the Plans. All joints shall include a suitable bond breaker between backing materials and sealant.

C. MASKING

Both sides of joints shall be masked with tape to prevent soiling floor, slab, or wall beyond limits of the joint.

D. PRIMING

Apply primer to all surfaces of joints in contact with sealant materials. Apply full strength and undiluted in a uniform coating of surface. Allow to set or cure prior to proceeding. Do not prime surfaces at back of joint.

E. APPLICATION

Sealant shall be gun applied, giving the joint a full bead of sealant. Skin beads are not acceptable. Tool the bead immediately after application to ensure a firm and full contact with the inner faces of the joint. Joints in sills and other wash surfaces shall be filled slightly convex to obtain a flush joint when dry. Entire perimeter of openings in concrete surfaces shall be sealed. Do not apply sealants to wet or damp surfaces nor in temperatures below 50 degrees F, and as required by the manufacturer. Strike off excess sealant with tooling stick or a knife so that finished bead is slightly below surface. Remove excess sealant as work progresses. Sealants in masonry wall joints are to be a maximum of 1/2-inch deep and not less than 1/4 inch in each dimension. When applying sealant, do not permit thickness of sealant to exceed 1/2 of the width of the joint. Any joints over 1/2-inch wide shall be reported to the Owner and instructions for correcting the applications will be given.

3.3 CLEANUP

Upon completion, the Contractor shall remove and dispose of masking materials. Remove any excess materials and clean adjacent surfaces free from any soiling or staining resulting from the sealing and caulking operations.

*** END OF SECTION ***

DIVISION 8 DOORS AND WINDOWS

SECTION 08110

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section covers furnishing and installing hollow metal doors, frames, and glazing as indicated on the Plans and as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
06190	Prefabricated Wood Trusses
04200	Masonry
08700	Finish Hardware

1.3 REFERENCES

This Section references the latest revisions of the following documents:

ANSI/SDI A250.8	Specification for Standard Steel Doors and Frames
ANSI/SDI A250.11	Recommended Erection Instructions for Steel Frames
ANSI Z97.1	Safety Glazing Materials Used in Buildings - Safety
	Performance Specifications and Methods of Test
ASTM A653	Standard Specification for Steel Sheet, Zinc-Coated
	(Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by
	the Hot-Dip Process
ASTM C1048	Standard Specification for Heat-Strengthened and Fully
	Tempered Flat Glass
ASTM E2190	Standard Specification for Insulating Glass Unit
	Performance and Evaluation
HMMA 840	Guide Specification for Installation and Storage of Hollow
	Metal Doors and Frames

1.4 QUALITY ASSURANCE

Hollow metal doors and frames shall conform to applicable requirements of ANSI/SDI A250.8.

1.5 SUBMITTALS

Submit shop drawings and product data under provisions of Section 01300.

Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, and finish.

Indicate door elevations and internal reinforcement.

1.6 REGULATORY REQUIREMENTS

Conform to applicable Building Code for fire rated frame and door requirements.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

The hollow metal doors and frames shall be as manufactured by Curries, Ceco, Amweld, Republic, Steelcraft, or any other SDI member.

2.2 DOORS AND FRAMES

Location Material

Exterior Doors ANSI/SDI A250.8 Level 3, Model 2

Provide door and frame types and sizes as shown on the Plans.

2.3 DOOR CONSTRUCTION

Exterior doors shall be polyurethane. Minimum U-value shall be as shown on the Plans.

2.4 FABRICATION

Provide fully welded frames for all new construction. Provide fabricated frames of knock down field assembly type for retrofit applications or for existing door openings.

Fabricate frames and doors with hardware reinforcement plates welded in place. Provide mortar guard boxes.

Prepare frame for silencers. Provide three single rubber silencers for single doors and mullions of double doors on strike side, and two single silencers on frame head at double doors without mullions.

Close top edge of exterior doors flush with inverted steel channel closure. Seal weld and grind smooth all door joints watertight. Caulking or filling with body filler of door seams is not acceptable.

2.5 FINISH

Exterior doors and frames shall be treated with a galvannealed zinc coating per ASTM A653 with a minimum application rate of 0.60 oz/ft2, or A60 material. Finish painting shall be in accordance with Section 09900 of these Specifications.

The inside of the metal frame profile shall be coated with the dissimilar metals system per Section 09900 of these Specifications.

PART 3 EXECUTION

3.1 INSTALLATION

Frames shall be installed plumb, level and rigid in accordance with ANSI/SDI A250.11 and with HMMA 840. Doors shall be installed in accordance with HMMA 840.

Coordinate with masonry and stud wall construction for proper anchor placement and with installation of glazing. All door frames installed in masonry construction shall be completely filled with the masonry mortar utilized to install the masonry units or be fully grouted with non-shrink grout after installation of the frame. All door frames installed in cast-in-place concrete structures shall be fully grouted with non-shrink grout.

Install door hardware per Section 08700 of these Specifications.

Contractor shall protect doors and frames as necessary during construction of the Project.

3.2 TOLERANCES

Clearance between the door and frame head and jambs shall be 1/8 of an inch. Clearance between the meeting edges of pairs of doors shall be 3/16 of an inch plus or minus 1/16. Maximum diagonal distortion shall be 1/8 of an inch, measured with straight edge, from corner to corner. Clearance between the face of door and the door frame stops shall be 1/16 to 1/8 on an inch.

3.3 ADJUSTING DOORS

Adjust doors and hardware for smooth and balanced door movement.

*** END OF SECTION ***

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SECTION 08330

COILING DOORS AND GRILLES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of furnishing and installing electric operated rolling door with steel insulated panels as indicated on Plans and specified herein. The Contractor shall also provide and install operating hardware and supports.

1.2 RELATED SECTIONS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
04200	Masonry

1.3 SUBMITTALS

A. PRODUCT DATA

Submit manufacturer's product data and installation instructions for rolling door. Include specific data prepared for this project.

B. SHOP DRAWINGS

Submit shop drawings for approval prior to fabrication. Include detailed plans, delvations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

C. SAMPLES

Prior to ordering products, submit physical color chips of manufacturer's standard color samples for Owner's selection.

1.4 OPERATION AND MAINTENANCE DATA

The Contractor shall provide manufacturer's operation and maintenance data; include data for transmission, shaft and gearing, lubrication frequency, spare part sources.

1.5 QUALITY ASSURANCE

A. MANUFACTURER

Rolling door shall be manufactured by a firm with a minimum of 10-years experience in the fabrication and installation of rolling doors.

Manufacturers proposed for use, which are not named in these Specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past 5 years.

B. INSTALLER

Installation of rolling door shall be performed by an authorized representative of the manufacturer.

C. SINGLE-SOURCE RESPONSIBILITY

Provide doors, guides, and related primary components from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

D. PRE-INSTALLATION CONFERENCE

Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures, and construction operations.

1.7 WARRANTY

Provide a manufacturer's 2-year warranty for the door and operator system.

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PART 2 PRODUCTS

2.1 MANUFACTURERS

Wayne Dalton, or approved equal.

2.2 MATERIALS

800C Series Insulated Service Door.

A. CURTAIN

Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.

- 1. Flat profile. The front slat shall be fabricated of 18-gauge galvanized steel. The back slat shall be 24-gauge galvanized steel.
- 2. Slat cavity shall be filled with CFC-free foamed-in-place, polyurethane insulation to meet R-value shown on the Plans and as required by code.

B. FINISH

Slats and hood shall be galvanized steel in accordance with ASTM A653 and receive rust-inhibitive, roll coating process, including bonderizing, 0.2-mils-thick baked-on prime paint, and 0.6 —mils-thick baked-on polyester (powder coated) top coat. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

C. COLOR

Powder coating finish in color as selected by the Owner from manufacturer's standard colors.

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D. WINDLOAD DESIGN

Design and size components to withstand loads caused by pressure and suction of wind acting normal to the plane of wall as calculated in accordance with the design parameters shown on the Contract Drawings, current applicable code(s), and for a minimum of 22 PSF.

E. WEATHERSEALS

Vinyl bottom seal, exterior guide and internal hood seals with optional air infiltration package to reduce air infiltration to less the 1.0 cfm per square foot of door area.

F. BOTTOM BAR

Two prime painted galvanized steel angles, minimum thickness 1/8-inch bolted back to back to reinforce curtain in the guides.

G. GUIDES

Three galvanized structural steel angles with minimum thickness of 3/16 inch. Guides shall be weatherstripped with a vinyl weather seal at each jamb, on the exterior curtain side.

H. BRACKETS

Hot rolled galvanized steel to support counterbalance, curtain, and hood.

I. COUNTERBALANCE

Helical torsion spring type designed for standard 20,000 cycle life design. Counterbalance shall be housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.

J. HOOD

Galvanized steel, 24-gauge hood with intermediate supports as required. Provide with internal hood baffle weatherseal.

K. MANUAL OPERATION

Chain Hoist

L. LOCKING

Interior bottom bar slide boltlock for manually operated doors. Chain keeper locks for chain hoist operation.

Interior slide bolt lock for electric operation with interlock switch.

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M. WALL MOUNTING CONDITION

Face-of-wall mounting.

PART 3 EXECUTION

3.1 EXAMINATION

The Contractor shall verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits. Beginning of installation means installer acceptance of existing surfaces.

3.2 PREPARATION

The Contractor shall prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.3 INSTALLATION

The Contractor shall install door unit assembly in accordance with manufacturer's instructions. Anchor assembly to wall construction and building framing without distortion or stress. Securely brace door tracks suspended from structure. Secure tracks to structural members only. Fit and align door assembly including hardware, level, and plumb, to provide smooth operation. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

3.4 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation from Plumb: 1/16 inch.
- C. Maximum Variation from Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch with the use of a 10-foot-long straight edge.

3.5 MANUFACTURER'S FIELD SERVICES

Prepare, adjust and startup system. Ensure the operation and adjustments to door assembly for smooth operation.

3.6 ADJUSTING

The Contractor shall adjust door assembly to smooth operation.

3.7 CLEANING

The Contractor shall clean door and frames. Remove labels and visible markings. Touchup damaged coatings and finishes and repair minor damage.

3.8 PROTECTION OF FINISHED WORK

The Contractor shall protect finished work after the installation. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

*** END OF SECTION***

SECTION 08700

FINISH HARDWARE

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section specifies that the Contractor shall provide complete finish hardware and suitable fastenings for the project. Quantities listed in any instance are for supplier convenience only and are not guaranteed.

Finish hardware includes items known commercially as "builders' hardware" required, for swinging doors. Hardware specified in the same section as the door and/or doorframe will be furnished by the supplier of that Section.

All hardware furnished in this Section shall comply with the requirements of all applicable codes. All items specified in this Section shall be furnished by a factory-authorized distributor maintaining parts, stocks, and services for standard specified items.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
08110	Hollow Metal Doors and Panels

1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ANSI/NFPA 80	Fire Doors and Windows
ANSI/NFPA 101	Code for Safety to Life from Fire in Buildings and
	Structures
UL	Building Materials List

1.4 SUBMITTALS

Submit hardware under the provisions of Section 01300. Indicate product number and finish for all hardware.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURER'S

Finish hardware shall be as manufactured by the suppliers listed in the following sections.

2.2 FINISHES

Finishes for hardware items specified shall be as follows:

<u>Finish</u>
US26D (626)/US32D (630)
US32D (630)
US65 (689)
US26D (626)
As listed
US26D (626)/US32D (630)

2.3 BUTTS

Butts shall be 4-1/2" x 4-1/2" for 3'-0" and under and 5" x 4-1/2" for over 3'-0", except as required for 180-degree swing and shall be of the type listed. Doors up to and including 90 inches in height shall have 1-1/2 pair and doors over 90 inches in height shall have two pair. For unusual size or weight doors, furnish type, size, and quantity recommended by the butt manufacturer. All exterior-outswinging doors shall have non-removable pins. Concealed bearing hinges shall have bearing designs that eliminate metal-to-metal contact between knuckles and between the pin and barrel.

Butts shall be as specified in the hardware groups and shall be as manufactured by McKinney, or equal.

2.4 LOCKSETS

Locksets shall be Grade 1 mortise locksets with 2-3/4-inch backsets and 3/4-inch antifriction latch bolt. All locksets and latchsets shall be the product of one manufacturer and shall be UL approved. Functions as indicated in the hardware groups. Provide curved lip strikes with sufficient lip strike to protect trim, i.e. 3/4 inch latch bolts require 3/4-inch minimum clearance for trim, otherwise extended lip strikes must be furnished. Deadbolt functions shall be 1-inch projection.

All locks shall have wrought box strikes.

Locksets and latchsets shall be as specified in the hardware groups and shall be as manufactured by Corbin Russwin, or equal.

2.5 MANUAL FLUSH BOLTS AND DUSTPROOF STRIKE

Dustproof strikes shall be designed for use with a bottom flush bolt and have a spring loaded plunger that returns to floor or threshold level when the flush bolt is retracted.

Manual flush bolts and dustproof strikes shall be as specified in the hardware groups and shall be as manufactured by Rockwood, or equal.

2.6 DOOR CLOSERS, SURFACE

Door closers shall be as manufactured by Norton, Corbin Russwin, or equal. Drop plates shall be furnished where required. Hex nuts and bolts shall be furnished for all doors.

Closers shall be provided as specified in hardware groups and shall have a 10-year guarantee.

2.7 STOPS

All doors are to have a wall stop or floor stop unless otherwise specified. Where wall stops are specified but cannot be used, substitute a floor stop. If wall stop or floor stop cannot be used, advise the Owner of the specific door during submittal process. Provide proper height floor stops to suit conditions. Contractor to provide solid backing for all wall mounted stops. Stops shall be as manufactured by Trimco, or equal.

2.8 GASKET, THRESHOLD AND RAIN DRIPS

Gaskets and thresholds shall be as specified in the hardware groups and shall be as manufactured by Pemko, or equal.

Provide rain drips at header of all exterior doors. Rain drips shall be extruded aluminum not less than 0.07 in thick, clear anodized or painted to match door frame color. Rain drips shall be approximately 1-1/2 high by 2-1/2 inches projection and shall extend 2 inches on either side of the door opening width.

2.9 KEYING

All cylinder items shall be furnished with visual key control with key code stamped on the face of the keys and marked on the back or side of the cylinders.

All standard cylinder items shall be furnished with construction-keyed cylinders.

The Contractor shall coordinate the keying for door locks with the Owner.

2.10 KEY QUANTITIES

Keys shall be furnished in the following quantities:

Type	Quantity
MKs	6 each
Construction Keys	6 each
Change keys per keyed cylinder	2 each
Control keys	2 each

2.11 HARDWARE GROUPS

A. MANUFACTURER'S LIST

Manufacturer	Abbreviation
Corbin Russwin	CO
Ives	IV
McKinney	MK
Pemko	PE
Trimco	TR
Rockwood	RW

B. Refer to door schedule and related information concerning the following hardware groups:

HW1 (exterior secure single door)

	Butts 3386, 630	MK
1 ea.	Lockset ML2051 LWA, 630	CO
1 ea.	7-Pin IC Cylinder 1080-112-A02, 630	CO
1 ea.	Wall stop 1270	TR
1 ea.	Closer 8210, A12, M71, M73, M75	CO
1 ea.	Threshold 1715	PE
1 ea.	Door bottom 210 DPK	PE
1 set	Gaskets 2891, 290 DPK	PE

HW3 (roll up door)

All hardware provided by door manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

Refer to A.S.A.H.C., B.H.M.A., and S.D.I. for mounting heights.

Unless a conflict arises, the following are standard mounting heights on some products. If a question or conflict should arise, the hardware supplier, if requested, shall assist the Contractor and Owner in determining mounting heights. All measurements are from finish floor except top butt.

A. BUTTS

Top 11-3/4-inch center of butt to top of door. Intermediate equal distance between top and bottom butts. Bottom 13-inch center of butt.

B. KNOB LOCKS

40-5/16 inch to center of strike DEADLOCKS: 60 inch to center of strike.

C. EXIT DEVICES

40-5/16 inch to center of strike PUSH PLATES: 45 inch to center.

D. PULL PLATES

42 inch to center DOOR CLOSERS: as per manufacturer's instructions.

E. RAIN DRIPS

Align rain drips with bottom edge of doorframe rabbet. Drips shall be set in sealant and fastened with stainless steel screws.

3.2 ADJUSTING

Hardware shall be adjusted for correct operation.

After installation of hardware and before the building is accepted, Contractor shall inspect the installation and certify that the hardware is correctly installed in accordance with the manufacturer's recommendations. Hardware installer shall make any necessary adjustments.

*** END OF SECTION ***

DIVISION 9 FINISHES

SECTION 09250

GYPSUM WALLBOARD

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of all labor, materials, and equipment for all gypsum wallboard, zinc-coated trim, taping, spackling, and texturing necessary to complete all the work indicated on the Plans and as specified. The work shall include installation of gypsum board, exterior and interior grounds, corner beads, taping, spackling, sanding, and texturing of all joints and nail or screw heads to obtain finished walls ready for painting.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
06190	Prefabricated Wood Trusses

1.3 REFERENCES

This Section references the latest revisions of the following documents:

Reference	<u>Title</u>	
ASTM C473	Standard Test Methods for Physical Testing of Gypsum	
	Panel Products	
ASTM C474	Standard Test Methods for Joint Treatment Materials for	
	Gypsum Board Construction	
ASTM C475	Standard Specification for Joint Compound and Joint Tape	
	for Finishing Gypsum Board	
ASTM C840	Specification for Application and Finishing of Gypsum	
	Wallboard	
ASTM C1002	Specification for Steel Drill Screws for the Application of	
	Gypsum Wallboard	
ASTM C1047	Specification for Accessories for Gypsum Wallboard	
ASTM C1396	Standard Specification for Gypsum Board	
ASTM C1629	Standard Classification for Abuse-Resistant Nondecorated	
	Interior Gypsum Panel Products and Fiber-Reinforced	
	Cement Panels	

1.4 QUALITY ASSURANCE

All gypsum wallboard products and joint treatment products shall be obtained from a single manufacturer.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

Gypsum wallboard products and joint treatment products shall be as manufactured by National Gypsum Co., Georgia Pacific, USG Corp., or approved equal.

2.2 GYPSUM WALLBOARD

Moisture-Resistant Gypsum Wallboard shall conform to ASTM C1396, Type X. Thickness shall be 5/8 inch.

2.3 TRIM ACCESSORIES

Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for fastening and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, and one-piece control joint beads. Unless specifically noted as "exposed," all trim accessories shall be beaded type to be concealed with joint compound.

2.4 JOINT TREATMENT MATERIALS

Provide materials complying with ASTM C475, ASTM C840 and recommendations from the Manufacturer for the applications indicated. Provide 2-1/2-inches wide, perforated tape for joints. Provide two separate grades of ready-mixed, vinyl-type joint compound. One type shall be for bedding tapes and filling depressions. The second type shall be for taping and sanding.

2.5 FASTENERS

Screws shall conform to ASTM C1002 with heads, threads, points, and finish as recommended by the manufacturer.

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PART 3 EXECUTION

3.1 GENERAL

All workmanship and materials shall be of the best quality and any defective work shall be removed and replaced by the Contractor at no additional expense to the Owner. Keep the premises free of accumulations of debris and dust connected with this work and protect adjacent finished surfaces from damage by this work. The Contractor shall establish and maintain application and finishing environment in accordance with ASTM C840. For non-adhesive attachment of gypsum wallboard to framing, maintain not less than 40 degrees F.

3.2 INSTALLATION

All drywall sheets shall be set with staggered joints and screws and/or nails set deep enough to receive a cover of spackle, spaced in accordance with Wallboard Manufacturer's standard specifications. Install approved zinc-coated corner molds at openings and terminations of wallboards. Cut all wallboard close to and around wall penetrations and electrical outlets. Provide a complete, covered installation in all areas where gypsum wallboard is to be installed.

3.3 FINISHING

After the wallboard has been installed, it shall be finished. Apply joint compound or bedding compound and embed tape leaving uniform thickness of materials underneath tape. Cover screw heads smooth with finished surface of board after each application of joint material. After initial application has been complete, it shall be allowed to dry and then sanded smooth. Additional coats of joint compound shall be applied and finish sanded until a Level 5 finish has been achieved in accordance with ASTM C840 and left in a condition to receive paint. Obtain Owner's approval prior to applying paint.

3.4 ESCUTCHEONS

Provide escutcheons around all pipe, conduit, and similar types of penetrations through gypsum wallboard walls and ceiling.

*** END OF SECTION ***

SECTION 09900

PAINTING

PART 1 GENERAL

Section

1.1 SCOPE

The work specified in this Section covers the furnishing and installation of protective coatings, complete-in-place. Special shop coatings and/or factory-applied finishes on manufactured or fabricated items may be specified elsewhere. Regardless of the number of paint coats previously applied, at least two field coats of paint shall be applied to all surfaces unless otherwise specified herein. Field painting is not required for factory prefinished equipment items such as pumps, blowers, motors, etc. Touchup of the factory applied coatings may be required.

The word "paint" as used herein shall be taken to include all protective coatings and incidental materials as required with the exception that anodized aluminum or zinc galvanized coatings shall not be considered as paint.

Unless specifically noted otherwise in these Specifications or on the Plans, all work performed under this Contract (both new work and modifications to existing facilities) shall be painted. If an existing wall or ceiling (or similar surface) is modified in someway, the entire wall or ceiling surface is to be painted.

Item

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
03300	Concrete
04200	Masonry
06200	Finish Carpentry
07620	Sheet Metal Flashing and Trim
07900	Caulking and Sealant
08100	Hollow Metal Doors and Frames
Division 5	Metals
Division 11	Equipment
Division 13	Special Construction
Division 14	Conveying Systems
Division 15	Mechanical
Division 16	Electrical
	01300 03300 04200 06200 07620 07900 08100 Division 5 Division 11 Division 13 Division 14 Division 15

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1.3 REFERENCED STANDARDS

The following standards are referenced and shall be considered a part of these Specifications:

American National Standards Institute (ANSI):

A159.1, Surface Preparation Specifications;

Z53.1, Safety Color Code for Marking Physical Hazards

American Society for Testing and Materials (ASTM):

D4263, Standard Test Method for Indicating Moisture in Concrete by the

Plastic Sheet Method

E84, Standard Test Method for Surface Burning Characteristics of Building Materials

National Fire Protection Association (NFPA):

101, Life Safety Code

Steel Structures Painting Council (SSPC):

SP-1, Solvent Cleaning

SP-2, Hand Tool Cleaning

SP-3, Power Tool Cleaning

SP-5, White Metal Blast Clearing

SP-6, Commercial Blast Cleaning

SP-7, Brush-off Blast Cleaning

SP-10, Near-White Blast Cleaning

SP-11, Power Tool Cleaning

SP-13 Surface Preparation for Concrete Surfaces

VIS-89. Visual Standard

1.4 **DEFINITIONS**

A. PAINT

Includes fillers, primers, sealers, emulsions, oils, alkyds, latex, enamels, thinners, stains, epoxies, vinyls, urethanes, shellacs, varnishes and any other applied coating specified within these Specifications or shown on the Plans.

B. FINISHED ROOM OR SPACE

One that has a finish called for on Room Finish Schedule, or is indicated on the Plans, or is specified herein, to be painted.

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C. PAINTING COVERAGE RATE

Coverage's expressed in SF/GAL/coat are the manufacturer's published theoretical coverage's in square feet per gallon per coat.

1.5 SUBMITTALS

In addition to the general submittal requirements listed in Section 01300, the following shall be submitted:

- 1. Written acknowledgment and certification that products submitted meet requirements of standards referenced in this Section.
- 2. Manufacturer's application instructions for primer and finish coats.
- 3. Manufacturer's surface preparation instructions.
- 4. Manufacturer's full line of color samples for color selection by Owner.
- 5. If products being used are manufactured by a company other than the specified reference standard, the Contractor must provide a complete comparison of the proposed products with the specified reference products per Part 2.1 requirements, including application procedure, coverage rates, and verification that product is designed for intended use. Information must be provided that demonstrates that manufacturer's products are equal to the performance standards of products manufactured by the Tnemec Company, which is the reference standard.
- 6. Manufacturer's approval of protective coating systems applicator.
- 7. List of Applicator's experience and qualifications. A minimum of 5-years of experience in the painting of wastewater treatment plant facilities required.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

The following is an approved coating systems manufacturers list subject to compliance with the Specifications contained herein:

- 1. Ameron Protective Coatings Division.
- 2. Sherwin Williams.
- 3. Tnemec Company.
- 4. Or equal.

The specified coating shall be understood as establishing the type and quality of coating desired. Other manufacturers' products will be accepted provided sufficient information is submitted to allow the Engineer to determine that the coatings proposed are equivalent to those named. Proposed coatings shall be submitted for review in accordance with these Specifications. Requests for review of equivalency will not be accepted from anyone except the Contractor, and such requests shall not be considered until after the Contract has been awarded.

No substitutions shall be allowed that change the number of coats, thickness or generic type of paint required. All materials shall be brought to the jobsite in the original sealed and labeled containers of the paint manufacturer and shall be subject to inspection by the Engineer.

No coating materials other than those specified shall be brought to the jobsite. Thinners, driers and oils brought to the jobsite shall be only those recommended and approved by the paint manufacturer.

All paint shall conform to the applicable air quality regulations at the point of application. Any paint material which cannot be guaranteed by the manufacturer to comply, whether specified by product designation or not, shall not be used.

It shall be the responsibility of the Contractor to ensure the compatibility of the field painting products which will be in contact with each other or which will be applied over shop painted or previously painted surfaces. Paint used in successive field coats shall be produced by the same manufacturer. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to the underlying paint.

All paint used for intermediate and finish coats shall be guaranteed by the paint manufacturer to be fumeproof and suitable for wastewater plant atmospheres containing hydrogen sulfide. Any paint that cannot be so guaranteed shall not be used. Paint shall be lead-free and mercury-free if available, but in no case shall the lead or mercury content cause discoloration in a wastewater plant atmosphere.

Themec Company products are the reference standard and Themec designations for product type are used herein. Requirements for an approved equal product are listed below:

- 1. For approval of an equal manufacturer. The Contractor shall provide to the Owner in writing a detailed side-by-side comparison of the proposed equal Products Characteristics, Performance Characteristics, and Application Conditions for each Tnemec coating specified in this specification. For consideration for approval this written comparison shall be certified and notarized by an officer of the proposed manufacturer as true and correct.
- 2. For Products Characteristics this detailed side-by-side comparison shall include for example, but not limited to, Volume Solids, Weight Solids, VOC, Mix Ratio, Zinc Content in Dry Film (by Weight), Spreading Rate per coat, Drying Schedule, Shelf Life and Flash Point.
- 3. For Performance Characteristics this detailed side-by-side comparison shall include for example, but not limited to, Abrasion Resistance, Corrosion Weathering, Direct Impact Resistance, Dry Heat Resistance, Flexibility, Moisture Condensation Resistance, Pencil Hardness, Salt Fog Resistance, Slip Coefficient and Wet Heat Resistance
- 4. In addition to the detailed side-by-side comparison for approval of an equal manufacturer, The Contractor shall provide to the Owner in writing five similar installations that have had the proposed or equal coating system and date coating system was put into service. In addition the installations names, locations, and owner's name with contact person and telephone number shall be provided.
- 5. For consideration for approval as an equal coating system the detailed side-by-side comparison shall be submit, with successful bidder's Shop Drawing at the time of the Preconstruction Conference, along with any proposed monetary adjustments to the contract price. As with all shop drawings, final approval rests with the Owner.
- 6. As a minimum standard any equal coating system shall have a 5-year service history on its coating system.

2.2 PAINT SYSTEMS

A. SUBMERGED METAL.

1. Scope

This Section shall apply to all metal, other than bituminous coated pipe and materials, which are to be continuously or intermittently submerged in sewage, water or sludge unless specified otherwise.

2. Surface Preparation

Near-white blast cleaning, SSPC-SP-10.

3. Coatings

Primer System:

Coat One

Product: Tnemec Series #20/FC#20 Pota-Pox

MDFT: 4 to 6 mils

Finish System:

Coat One

Product: Tnemec Series #20/FC#20 Pota-Pox

MDFT: 4 to 6 mils

Total MDFT: 8.0 mils

B. NON-SUBMERGED METAL - MILD CONDITIONS

1. Scope

This Section shall apply to all metal which is not submerged but is located indoors which is not subject to splashing from sewage, water, sludge, oil and grease or other corrosive materials unless specified otherwise.

2. Surface Preparation

Commercial blast cleaning, SSPC-SP-6.

3. Coatings

Shop Primer System:

Coat One

Product: Omnithane Series 1
MDFT: 2.5 to 3.5 mils

Field Finish System:

Coat One

Product: Hi-Build Epoxoline Tnemec Series N69

MDFT: 4 to 6 mils

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Coat Two

Product: Hi-Build Epoxoline Tnemec Series N69

MDFT: 4 to 6 mils

Total MDFT: 11.0 mils

C. COATING OF FACTORY NON-APPROVED FINISHES

1. Scope

This Section shall apply to all interior and exterior steel windows and frames and other similar type of items which have a factory finish which is not an approved corrosion resistant finish.

2. Surface Preparation

Factory coating is to remain. Provide clean surfaces, lightly sand 100 percent of the surfaces, then provide solvent cleaning, SSPC-SP-1.

3. Coatings

Primer System:

Coat One

Product: Typoxy Tnemec Series N27

MDFT: 2 to 3 mils

Finish System:

Coat One

Product: Endura-Shield III Tnemec Series 73

MDFT: 3 to 5 mils

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Total MDFT: 5.0 mils

D. STRUCTURAL STEEL - MILD CONDITIONS

1. Scope

This Section shall apply to all interior structural steel. Items which are interior but may be exposed to splashing of liquids or corrosives shall be coated for severe conditions.

2. Surface Preparation

Commercial blast cleaning, SSPC-SP-6.

3. Coatings

Shop Primer System:

Coat One

Product: Omnithane Series 1
MDFT: 2.5 to 3.5 mils

Field Finish System:

Coat One

Product: Hi-Build Epoxoline Tnemec Series N69

MDFT: 4 to 6 mils

Coat Two

Product: Hi-Build Epoxoline Tnemec Series N69

MDFT: 4 to 6 mils

Total Field applied MDFT: 11.0 mils

E. DUCTILE IRON PIPE AND FITTING MATERIALS (IMMERSION)

1. Scope

This Section shall apply to exposed ductile iron pipe, fittings and materials that are continuously or intermittently submerged or exposed to splash or spill of liquids or corrosive atmospheres. This includes all ductile iron materials installed in a wet well, sump, manhole, vault, pullhole, or similar type of structure. Non-immersion service is covered elsewhere in this Specification.

2. Surface Preparation

Provide surface profile in accordance with ASTM D 4417, Method C

3. Coatings

Primer System:

Coat One

Product: Omnithane Series 1
MDFT: 2.5 to 3.5 mils

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Mason County PUD No. 1 Manzanita Reservoir and Booster Pump Station G&O #22260 Finish System:

Coat One

Product: Hi-Build Epoxoline Tnemec Series 446

MDFT: 8 to 10 mils

Coat Two

Product: Hi-Build Epoxoline Tnemec Series 446

MDFT: 8 to 10 mils

Total field applied MDFT: 16.0 mils

F. DUCTILE IRON PIPE AND FITTING MATERIALS (NON-IMMERSION)

1. Scope

This Section shall apply to exposed ductile iron pipe, fittings and materials that are not continuously or intermittently submerged. Continuously or intermittently submerged items are covered elsewhere in this Specification.

2. Surface Preparation

Provide surface profile in accordance with ASTM D 4417, Method $\ensuremath{\mathrm{C}}$

3. Coatings

Primer System:

Coat One

Product: Omnithane Series 1 MDFT: 2.5 to 3.5 mils

Finish System:

Coat One

Product: Hi-Build Epoxoline Tnemec Series N69

MDFT: 4 to 6 mils

Coat Two

Product: Endura-Shield III Tnemec Series 73

MDFT: 3 to 5 mils

Total MDFT: 10.0 mils

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G. GALVANIZED SURFACE TOUCHUP

1. Scope

This Section shall apply to all galvanized surfaces, which have received minor damage to the galvanized surface during construction.

2. Surface Preparation

Power tool cleaning, SSPC-SP-3.

3. Coatings

Paint System:

Product: Tnemec-Zinc Tnemec Series 90-97

MDFT: 3 to 5 mils

Total MDFT: 3.5 mils

H. ALUMINUM BURIED IN CONCRETE - DISSIMILAR METALS

1. Scope

This Section shall apply to all surfaces, which are conducive to corrosion due to interactions between dissimilar metals, or to chemical reactions, to include embedments in cast-in-place or precast concrete or masonry grout. This Section applies to aluminum, hot-dipped galvanized steel, and any other metals that have a dissimilar metals or chemical reaction concern when installed or embedded in concrete, or against concrete, mortar or grout.

2. Surface Preparation

Lightly sand with 150 grit sandpaper to degloss and roughen surfaces. Solvent cleaning, SSPC-SP-1.

3. Coatings

Finish Coat

Product: Hi-Build Epoxoline Tnemec Series N69

MDFT: 4 to 6 mils

Total MDFT: 4.0 mils

I. GYPSUM WALLBOARD AND EXTERIOR SOFFIT BOARD (ESB)

1. Scope

This Section shall apply to all exposed gypsum wallboard and ESB surfaces.

2. Surface Preparation

Sandpaper smooth, dust and contaminant free.

3. Coatings

Primer System:

Coat One

Product: Sealer Tnemec Series 151-1051

MDFT: 1.5 to 2.5 mils

Finish System:

Coat One

Product: H. B. Tnemec-Tufcoat Tnemec Series 1029

EndurTone

MDFT: 2 to 4 mils

Coat Two

Product: H.B. Tnemec-Tufcoat Tnemec Series 1029

EnduraTone

MDFT: 2 to 4 mils

Total MDFT: 5.5 mils

J. METAL DOORS, FRAMES, AND TRIM

1. Scope

This Section shall apply to all interior and exterior hollow metal doors and windows, frames and trim.

2. Surface Preparation

All hollow metal doors, windows and frames shall be bonderized, pickled or phosphatized, which will serve as the primer for and shall be compatible with the finish coats to be applied in the field. Prior to field coat application, the surface shall be solvent cleaned SSPC-SP-1, and shall be clean, dry and free of all dirt, oil, grease and any other contaminants.

3. Coatings

Primer System:

Coat One

Product: Tnemec Series 27 Typoxy

MDFT: 3 to 5 mils

Finish System:

Coat One

Product: Tnemec Series 73 Endurashield

MDFT: 3 to 5 mils

Total MDFT: 6.0 mils

K. PAINTED WOOD AND WOOD TRIM

1. Scope

This Section shall apply to all exposed to view interior and exterior wood and wood trim for buildings and structures. Color shall be selected by the Owner.

2. Surface Preparation

Wood surfaces shall be clean and dry. Sand wood as required.

3. Coatings

Primer System:

Product: Electrogrip, Tnemec Series 151

MDFT: 1.5 to 2 mils

Finish System:

Coat One:

Product: Envirocrete, Tnemec Series 156

MDFT: 3 to 4 mils

Coat Two:

Product: Envirocrete, Tnemec Series 156

MDFT: 3 to 4 mils

Total MDFT: 9 mils

L. BURIED CONCRETE EXTERIOR SURFACES

1. Scope

This Section shall apply to buried exterior concrete surfaces where noted on the Drawings. Coat following installation of pipe penetrations and grout, and prior to caulking.

2. Surface Preparation

Concrete surfaces shall be clean and dry. Allow 28 days cure time for concrete, or until surface passes the ASMT D4263 Plastic Mat test (may be less than 28 days for various grout mixes).

SSPC SP13 preparation of concrete surfaces to a standard profile of ACRI CSP 3-5 on all concrete surfaces to be coated. For recoating and repair, mechanically abrade coating surface to provide the ACRI CSP 3-5 standard profile.

Grout all joints, pipe penetrations, lift holes, and hardware pockets with Tnemec Series 218 MortarClad, prior to providing surface filler coat.

3. Coatings

Surface Filler:

Product: Tnemec Series 218 Mortar Clad

MDFT: Apply 1/32 inch and to fill any bugholes and

surface voids flush to plan of concrete. Provided a monolithic, pinhole-free surface. Provide multiple coats of filler as required.

Finish System (1):

Product: Tnemec Series 141 PotaPox

MDFT: 16 mils DFT

High Water Table Alternative Finish System (2):

Product: Tnemec Series 264 Elasto-Shield

MDFT: 70 to 80 mils DFT

M. EXPOSED TO VIEW EXISTING INTERIOR CONCRETE, CMU AND CEILING SURFACES IN OCCUPIED OR SEMI-OCCUPIED SPACES

1. Scope

This section shall apply to all exposed to view existing interior concrete, CMU and ceiling surfaces in occupied or semi-occupied spaces within buildings or structures including walls, floors and ceilings as noted on the drawings that require a newly painted surface be applied.

2. Surface Preparation

Surfaces shall be prepared in accordance with section 3.3 of this Specification.

3. Coatings

Finish System:

Two Coats:

Product: Envirocrete, Tnemec Series 156

MDFT 8 mils of finish product

2.3 COLORS

A. GENERAL

Paint colors used for the finish coatings on process equipment, piping and building surfaces shall conform to the following schedules. All finishes shall be glossy unless otherwise specified. Finish coatings, which are applied in the shop by the manufacturer, shall conform with this color schedule wherever possible. Factory coatings which are damaged during shipment or installation, or which are not of suitable color, as determined by the Engineer, shall be recoated in the field in accordance with these Specifications. Color samples shall be submitted to the Engineer for approval prior to application of any field coatings.

B. PIPING COLOR SCHEDULE

<u>Piping Identification</u>: Exposed piping and piping in accessible chases shall be identified with lettering or tags designating the service of each piping system, shall have flow directional arrows, and shall be color coded as scheduled below.

Piping scheduled to be color coded shall be completely painted with the indicated colors, except surfaces specified to be unpainted shall have segments painted with the specified coding color long enough to accommodate the required lettering and arrows. All other piping specified to be painted shall match adjacent surfaces, unless otherwise approved by the Engineer.

<u>Location</u>: Lettering and flow direction arrows shall be provided near equipment served, adjacent to valves, on both sides of walls and floors where pipe passes through, at each branch or tee, and at intervals of not more than 50 feet in straight runs of pipe. If, in the opinion of the Engineer, the foregoing requirements will result in an excessive number of labels or arrows on a run of pipe, the number required can be reduced.

Metal Tags: Where the outside diameter of pipe or pipe covering is 5/8 inch or smaller, metal tags shall be provided instead of lettering. Tags shall have the specified identifying lettering stamped in, and shall be fastened to the pipe with suitable chains. Metal tags and chains shall be aluminum or stainless steel. Where tags are used, pipe shall be color coded as specified.

<u>Lettering</u>: Lettering on piping shall be painted, stenciled, or snap-on markers. Snap-on markers shall be plastic sleeves as manufactured by Brady "Brady snap-on B-915," Seton "Setmark," or equal. Letter sizes shall be as follows:

Outside Diameter of Pipe or Covering	Minimum Height of Letters
5/8 inch and smaller	Metal tags - 1/4 inch
3/4 inch through 4 inch	3/4 inch
5 inch and larger	2 inches

<u>Color Coding and Lettering Schedule</u>: All piping for the following services shall be color coded and identified using the process names given below. Where scheduled, bands shall be 6-inches-wide spaced along the pipe at 5-foot intervals.

			Color of
Process	Abbreviation	Color of Pipe	Letters
Drain	D	Dark Gray	White
Potable Water	W	Dark Blue	White
Water	W	Dark Blue	White

All exposed piping shall be color coded and lettered. Pipes not tabulated above shall be color coded and lettered as determined by the Engineer.

Electrical conduit shall be painted to match adjacent ceiling or wall surfaces as approved by the Engineer. Vent lines shall be painted to match surfaces they adjoin, otherwise gray.

All valves shall be identified with a valve identification number. Contractor shall provide a computer file (Excel spreadsheet) with this information to the Engineer.

PART 3 EXECUTION

3.1 GENERAL

It is the intent of these Specifications that materials and workmanship be provided such that the highest quality job is obtained. The completed work, prior to acceptance, must be free from runs, skips, mars and any other disfiguring mark due to faulty workmanship or care of the completed work.

It is the responsibility of the Contractor to ensure that all surfaces are prepared in accordance with the written recommendations and directions of the paint manufacturer whose paint is applied.

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Approval of conditions shall be obtained from the Engineer prior to applying any or all coats of paint; however, such approval shall not relieve the Contractor of their responsibility of conformance with these Specifications and conformance with the manufacturer's recommendations.

It shall be the responsibility of the Contractor to prevent settling of dust or the occurrence of other conditions detrimental to the finished quality of the job and to repair any damaged paint at no additional cost to the Owner.

Materials or equipment delivered with prime coats shall be touched up as required prior to the application of additional coating(s).

The Contractor shall apply each coating at the rate and in the manner specified by the paint manufacturer. If material has thickened or must be diluted for application by spray gun, the coating shall be built-up to the same thickness achieved with undiluted material. Deficiencies in film thickness shall be corrected by the application of an additional coat(s) of paint. Film thickness shall be determined when dry by the Engineer with a magnetic dry film thickness gauge. The thickness gauge shall be calibrated with test shims.

Where thinning is necessary, only the products of the manufacturer furnishing the paint and for the particular purpose shall be allowed. All thinning shall be done strictly in accordance with the manufacturer's instructions as well as with the full knowledge and approval of the Engineer.

No paint shall be applied when the surrounding air temperature, as measured in the shade, is below 40 degrees F. No paint shall be applied when the temperature of the surface to be painted is below 35 degrees F. Paint shall not be applied to wet or damp surfaces and shall not be applied in rain, snow, fog or mist or when the relative humidity exceeds 85 percent. No paint shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 40 degrees F within 18 hours after the application of the paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, painting shall be delayed until conditions improve to be certain that the surfaces are dry prior to application of paint. No paint shall be applied when the ambient temperature is less than 5 percent F. above the dewpoint. Further, the day's painting shall be completed well within advance of the probable time of day when condensation will occur, in order to permit the paint film an appreciable drying time prior to the formation of moisture.

Manufacturer's recommended drying time shall be construed to mean "under normal conditions." Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer drying times shall be necessary. The manufacturer's recommendations for recoating time intervals shall be strictly adhered to.

Adequate ventilation, which will effectively remove solvents, shall be provided for proper drying of paints on interior surfaces. A <u>minimum</u> of 7-consecutive calendar days at 70 degrees F following the application of the final coat on submerged surfaces shall be required before submergence. Longer periods shall be allowed prior to submergence if recommended by the paint manufacturer or if weather conditions require a longer curing time.

3.2 MIXING AND THINNING

Paint shall be thoroughly mixed each time any is withdrawn from the container. Paint containers shall be kept tightly closed except while paint is being withdrawn.

Paint shall be factory mixed to proper consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain recommended coverage at lower application temperatures. Only thinners approved by the paint manufacturer shall be used. In no case shall the wet film thickness of applied paint be reduced, by addition of paint thinner or otherwise, below the thickness recommended by the paint manufacturer.

3.3 SURFACE PREPARATION

A. GENERAL

Surfaces shall be dry and thoroughly cleaned of foreign materials with all defects filled or removed. All trades employed shall leave the surfaces of their work in such a condition that only minor cleaning, sanding and filling is required of the painting trade for surface preparation.

Hardware, switchplates, machined surfaces, nameplates, lighting fixtures and all other surfaces not to be painted shall be removed or otherwise protected. Drop cloths shall be provided, where necessary, to avoid spotting of surfaces adjacent to the item being painted. Working parts of electrical equipment shall be protected from damage during surface preparation and painting operations.

Ferrous metal cleaning shall be in accordance with Steel Structures Painting Council Specifications (SSPC).

Description	SSPC
White Metal Blast Cleaning	SP-5
Commercial Blast Cleaning	SP-6
Brush-Off Blast Cleaning	SP-7
Near-White Blast Cleaning	SP-10
Preparation of Concrete	SP-13

The words "blast cleaning" or equivalent phrases of equal intent shall be taken to refer to the applicable SSPC specification when used in the paint manufacturer's recommendations or these Specifications.

Hand tool cleaning shall be used when power tool cleaning is not possible. Hand and power tool cleaning shall be in accordance with SSPC Specifications SP-2, SP-3 or SP-11, respectively.

The blast cleaning profile depth shall be not less than 1 mil or greater than 2 mils. In the case of equipment to which the manufacturer applies a primer coating in the shop after fabrication, the blast profile depth needs to be as noted above.

B. WOOD

The Contractor shall sandpaper smooth, then remove dust. After prime coat has dried, seal all knots, pitch and resinous sapwood. The Contractor shall putty nail holes and minor defects prior to painting.

C. FERROUS METAL, GALVANIZED METAL AND HOLLOW METAL SURFACES

The Contractor shall assure that fabrication, welding or burning is completed prior to the sandblasting operation. The Contractor shall chip or grind off flux, splatter, slag or other laminations left from welding. The Contractor shall remove all mill scale. The Contractor shall grind smooth rough welds and other sharp projections.

The Contractor shall near-white blast clean, in accordance with SSPC SP-10, submerged surfaces and surfaces to 12 inches above highest liquid level, and areas subject to splash or spillage.

The Contractor shall commercial blast clean, in accordance with SSPC SP-6, all interior and exterior structural steel surfaces, surfaces located 12 inches above submerged areas, and surfaces located in areas not subject to splash or spillage where exposed to open bodies of liquids.

The Engineer reserves the right to accept preparation of these surfaces in accordance with SSPC SP-3 for areas not practical or possible to sandblast to SSPC SP-6 requirements.

The Contractor shall near-white blast clean, in accordance with SSPC SP-10 surfaces, subject to heat in excess of 600 degrees F. The Contractor shall power tool or hand clean in accordance with SSPC SP-2 or SSPC SP-3. The Contractor shall apply prime coat on cleaned surfaces within 2 hours of cleaning. The Contractor shall solvent clean galvanized surfaces in accordance with SSPC SP-1.

D. EQUIPMENT

The Contractor shall sandblast the following equipment items or surfaces in accordance with applicable SSPC standards whether prime coated or not:

Shop primed surfaces, which have 2 percent or more of the primed surface damaged.

If catalyzed epoxy prime coat has been exposed to sunlight for longer than 60 days.

E. GYPSUM WALLBOARD

The Contractor shall repair minor irregularities left by finishers, avoid raising the nap of the paper and verify that the moisture content is less than 8 percent before painting. Contractor shall install sealant as required at edges of wallboard where it abuts different materials prior to painting.

F. CONCRETE AND CONCRETE BLOCK MASONRY

The Contractor shall allow new concrete and concrete block masonry to cure for a minimum of 28 days and shall verify that the moisture content contained in the concrete is stable and not in motion. The Contractor shall verify by performance of a Wet Matt Test per ASTM D4263. The Contractor shall fill concrete surface cracks and irregularities with Portland cement grout to provide a uniform surface texture and shall fill concrete block masonry surface with an epoxy block filler as specified. As a minimum, the Contractor shall brush off blast clean surfaces. The Contractor shall prepare the surface as specified elsewhere in these Specifications.

C. CONCRETE BLOCK MASONRY

The Contractor shall verify that the moisture content is acceptable as noted above, shall remove existing paint that has a tendency to powder, peel or shatter when scraped with a knife, shall hydroblast or sandblast the surfaces of any previous coatings, shall fill cracks and irregularities with portland cement grout to provide a uniform surface texture compatible with new concrete and shall fill concrete block masonry surfaces with a block filler.

G. PREPARATION BY SANDBLASTING

The Contractor shall not sandblast surfaces that will be wet after blasting and before painting. The Contractor shall apply primer to sandblasted surfaces the same day that the surface is blasted and before rusting occurs. The Contractor shall reblast surfaces allowed to set overnight prior to priming or surfaces that show rust bloom.

The sand shall be clean, water washed, with controlled particle size and high silica content. The sand shall have sharp, angular surfaces and contain no clay particles or other extraneous matter.

The profile depth of sandblasted surfaces shall be not less than 1 mil or greater than 2 mils, unless required otherwise by the coating manufacturer.

Compressed air for blasting shall be free of water and oil. The Contractor shall provide accessible separators and traps, shall confine sandblast sand to the area being blasted, shall provide shields of polyethylene sheeting or other such barriers to confine sand and shall plug pipes, holes or openings before sandblasting and keep them plugged until the sandblasting operation is complete and the sand is removed.

The Contractor shall protect nameplates, valve stems, rotating equipment, motors and other items that may be damaged from sandblasting. The Contractor shall reblast surfaces not meeting the requirements of these Specifications.

3.4 APPLICATION

A. GENERAL

The Contractor shall mix and apply coatings by brush, roller or spray in accordance with the manufacturer's installation instructions. Spraying equipment shall be inspected and approved in writing by the coating

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manufacturer. The Contractor shall provide complete coverage's to the mil thickness specified. The thickness specified shall be dry film mil thickness. All paint systems are "to cover." In situations of discrepancy between the manufacturer's square footage coverage rates and mil thickness, mil thickness requirements govern. When color or undercoats show through, the Contractor shall apply additional coats until paint film is of uniform finish and color. The Contractor shall not apply consecutive coats until the Engineer has had an opportunity to observe and approve previous coats.

The Contractor shall apply materials under adequate illumination, shall evenly spread and flow on to provide full, smooth coverage, shall work each application of material into corners, crevices, joints and other difficult to work areas, shall avoid degradation and contamination of blasted surfaces and avoid intercoat contamination, shall clean contaminated surfaces before applying next coat and shall immediately smooth out runs or sags, or remove and recoat entire surfaces. The Contractor shall assure that preceding coats are dry before recoating, shall recoat within the time limits specified by the coating manufacturer and shall allow coated surfaces to cure prior to allowing traffic or other work to proceed.

The Contractor shall coat all aluminum surfaces in contact with dissimilar materials. All fabricated and structural steel shall have prime coat(s) applied in the shop and finish coat(s) applied in the field.

During application of either prime or finish coats, brush coat all weld seams, edges, angles, fasteners and other irregular surfaces to insure a monolithic film, pinhole free surface. Finish coats of paint shall be uniform in color and sheen without streaks, laps, runs, drips, sags or missed areas.

All submerged or intermittently submerged materials shall have surface preparation and coatings applied <u>prior</u> to installation unless otherwise approved by the Engineer. All pipe, pipe supports, and pipe hangers that will be painted shall have surface preparation and coatings applied <u>prior</u> to installation.

B. PRIME COAT INSTALLATION

The Contractor shall prime all surfaces indicated to be painted, shall touch-up damaged primer coats prior to finish coats and shall assure field-applied coatings are compatible with factory-applied coatings. If coatings are not compatible, and if approved in writing by the Engineer, the

Contractor shall apply a 2-mil-thick universal barrier coat recommended by the paint manufacturer prior to applying field coats or completely remove factory coatings and reprime.

The Contractor shall prime ferrous metals bedded in concrete to a minimum of 1 inch below exposed surfaces. The Contractor shall backroll all primer coats applied to existing or new CMU block. The Contractor shall assure sandblasting operations do not result in the embedment of sand particles in paint film. The Contractor shall brush or spray bolts, welds, edges and difficult access areas with primer prior to primer application over the entire surface being coated. The Contractor shall backroll concrete, masonry, gypsum board and plaster surfaces with a roller if the primer has been spray applied.

C. FINISH SCHEDULE

All work performed under this Contract (both new work and modifications to existing facilities) shall be painted. If the finish schedule requires wall surfaces to be painted in a particular space, the Contractor shall paint all appurtenant surfaces unless specifically noted not to be painted on the Plans. These items to be painted shall include:

- 1. Pipe supports, and equipment supports.
- 2. Insulated or wrapped piping, valves, fittings, hydrants and appurtenances except where covered by lagging.
- 3. Insulated or wrapped ductwork and appurtenances.
- 4. Conduit and appurtenances.
- 5. Ferrous metals.
- 6. Exposed woodwork.
- 7. Copper and brass surfaces.
- 8. Inside and/or outside of ferrous metal tankage.
- 9. New machinery and equipment except:
 - a. Electrical panels;
 - b. Switchboards;

- c. Switchgear;
- d. Safety switches;
- e. Motor starter equipment;
- f. Busways;
- g. Raceways.

The Contractor shall paint the following surfaces in areas not considered as finished areas:

- 1. Insulated or wrapped piping, valves, fittings, yard or fire hydrants and appurtenances.
- 2. Insulated or wrapped ductwork and appurtenances.
- 3. Exposed wood.
- 4. New machinery and equipment.
- 5. Machinery and equipment in sumps, pits, boxes, channels, wetwells and structures.

The Contractor shall paint all exposed interior and exterior surfaces including:

- 1. Soffits.
- 2. Insulated or wrapped piping, valves, fittings, yard or fire hydrants and appurtenances except when covered by lagging.
- 3. Insulated or wrapped ductwork and appurtenances except when covered by lagging.
- 4. Conduit and appurtenances.
- 5. Exterior and interior surfaces of ferrous metal tankage.

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- 6. Ferrous metals.
- 7. Exposed wood.

- 8. Plaster surfaces.
- 9. Concrete block to be sealed, paint interior surfaces only.

The Contractor <u>shall not</u> paint the following elements unless specifically noted on the Plans to be painted:

- 1. Stainless steel surfaces except as required to identify piping.
- 2. Exposed to view aluminum surfaces.
- 3. Galvanized metal surfaces.
- 4. Fiberglass surfaces except fiberglass piping and piping appurtenances.
- 5. FRP ductwork unless gel coat color is not acceptable to the Owner.
- 6. Interior of pipe, ductwork, and conduits.
- 7. Moving parts of mechanical and electrical units.
- 8. Code labels and equipment identification and rating plates.
- 9. Piping, ductwork, or pipe conduit when enclosed between suspended ceiling and overhead slabs or located in pipe chases or surfaces to be lagged.
- 10. Factory-finished furniture, laboratory casework, metal toilet partitions, kitchen units, lockers, shop and storage equipment or miscellaneous items that have preapproved factory applied finishes.
- 11. Prefaced masonry, burnished masonry units, or glass masonry.
- 12. Structural steel or steel deck required to be fireproofed.
- 13. Contact surfaces of friction-type connections.
- 14. Pipe and/or duct lagging.

3.5 FIELD QUALITY CONTROL

The Contractor shall be responsible for performing, testing and assuring conformance with all requirements of these Specifications.

The Contractor shall maintain daily records showing:

- Start date of work in each area.
- Date of application for each following coat.
- Moisture content and surface temperature of substrate. Also record weather conditions, ambient air temperature and dew point.
- Provisions utilized to maintain temperature and humidity of work area within paint manufacturer's recommended ranges.

The Contractor shall measure the surface temperature of items to be painted with surface temperature gauges specifically designed for such use. The Contractor shall measure substrate humidity with humidity gauges specifically designed for such use. The Contractor shall measure wet paint with wet film thickness gauges. The Contractor shall measure paint dry film thickness with a Mikrotest gauge calibrated against the National Bureau of Standards "Certified Coating Thickness Calibration Standards." The Engineer may direct measurement of paint thickness at any time during the project to ensure conformance with these Specifications. A sufficient number of dry film thickness measurements shall be made so that there is approximately one measurement for each 100 square feet of surface area painted.

Where a wall or ceiling or other type of surface is disturbed and patched, the Contractor shall repaint entire wall or ceiling. The Contractor shall provide wet paint signs as necessary. The Contractor shall touch up damaged finish coats using the same material as specified for the finish coat.

At the conclusion of all painting activities, Contractor shall submit a painting field test report to the Engineer showing the above information plus results of wet film and dry film thickness tests. Provide four copies of final test report.

3.6 PAINTING SITE

Either shop painting or field painting and surface preparation shall be acceptable when painting work is performed in conformance with this Section, unless the painting is activity specified elsewhere in these Specifications.

3.7 PAINT THICKNESS

All paint thicknesses specified herein are minimum dry film thickness (MDFT). The thickness of paint over metallic surfaces shall be measured with a magnetic thickness gauge; paint thickness over wood or masonry shall vary in accordance with surface texture, but in no case shall the manufacturer's recommended coverage rate be exceeded. The minimum thicknesses given are total coating thickness for the coating specified, including multiple coats of the same material, where applicable.

*** END OF SECTION ***

DIVISION 11 EQUIPMENT

SECTION 11000

EQUIPMENT GENERAL PROVISIONS

PART 1 GENERAL

Continu

1.1 SCOPE

The provisions of this Section apply to all Sections of Divisions 11, 13, 15, and 16, unless specifically revised therein.

The Contractor shall direct the attention of all subcontractors and suppliers of equipment and related appurtenances for the work to the applicable provisions in the Contract Provisions wherever they may occur.

1.2 RELATED WORK SPECIFIED ELSEWHERE

T4 . . .

Section	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01800	Testing, Commissioning and Training
03300	Cast-in-Place Concrete
09900	Painting
11010	Vibration and Critical Speed Limitations
Division 11	Equipment
Division 13	Special Construction
Division 15	Mechanical
Division 16	Electrical

1.3 STANDARDS FOR THE WORK

Pipe, fittings, wiring and supports shall be provided to produce complete, operable systems with all elements properly interconnected as shown in schematic diagrams or to provide specified operations. If a specific dimensioned location is not shown for interconnections or smaller system elements, the Contractor shall select appropriate locations and show them on Shop Drawing submittals for review.

Equipment and material shall be new and without imperfections and shall be erected in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the recommendations of the manufacturers and the best standard practices for this type of work so that connecting and disconnecting of piping and accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and repair. Oil and lubrication fittings shall be located clear of and away from guards,

base, and equipment and within reach from the operating floor. In order to meet these requirements with equipment as furnished, minor deviation from the Plans may be made as authorized by the Engineer. All such minor deviations from the Plans that may include extending oil and lubrication fittings for accessibility and safety shall be executed at no additional cost to the Owner.

1.4 MANUFACTURER'S INSTRUCTIONS

The recommendations and instructions of the manufacturers of products used in the work are hereby made part of these Specifications, except as they may be superseded by other requirements of these Specifications.

1.5 SUBMITTALS

A. GENERAL

Product Submittals shall be provided to the Engineer for all equipment specified in Divisions 11, 13, 15, and 16, in accordance with Specification 01300, this Section and the respective equipment specification section. Submittals shall be dated and signed as certified for use in construction of this project.

B. MANUFACTURER'S LITERATURE

Manufacturer's literature shall be submitted for equipment, including, as applicable, performance characteristics, fan curves and pump curves, motor data sheets and methods of assembly.

The following minimum requirements shall accompany all manufacturers' literature submittals:

- 1. Description of materials.
- 2. Rating data Mechanical and Electrical as applicable.
- 3. Motor Data including bearing and enclosure information.
- 4. List of any special tools and/or spare parts required and to be furnished, if any.
- 5. Exceptions taken to the specification and detailed explanation why the exception is being taken.
- 6. Additional specific information that is specified in the equipment sections.

7. For motor driven equipment served by variable frequency drives (VFDs), provide vibration and critical speed requirements of the equipment, minimum speed requirements of motor and driven machinery, acceleration and deceleration requirements of the equipment, and torque and speed information as per Part 1.6 of this Section.

C. SHOP DRAWINGS

Shop Drawings shall be submitted showing sizes and arrangement of equipment, foundations and anchor bolts required, control diagrams, wiring diagrams, pipe hanging details, ductwork layouts and connections to other work. The arrangement of mechanical equipment and appurtenant piping shown on the Plans may be varied as necessary to fit the certified manufacturer's installation drawings. However, the manufacturer's drawings shall not deviate from the Plans and Specifications as to location, size, type and design of equipment.

The following minimum requirements shall accompany all shop drawing submittals:

- 1. Overall dimensions.
- 2. Mounting arrangement and dimensions.
- 3. Connection sizes and orientation.
- 4. Capacity and location of lifting eyes.
- 5. Motor arrangement showing location of electrical connections.
- 6. Detail electrical wiring diagrams, showing component designation and rating, and the connection points and associated terminals and cable identification for connection to the process control system.
- 7. The Contractor shall ascertain the location of all electrical (power and control) connections in order to properly orient electrical conduits.

D. DESIGN CALCULATIONS

Seismic design calculations shall be submitted for equipment and for supports and anchorage for equipment.

Special seismic certification shall be submitted for all active mechanical and electrical equipment that must remain operable following an earthquake in compliance with ASCE 7-10 *Minimum Design Loads for Buildings and Other Structures*, Chapter 13 Seismic Design for Nonstructural Components.

E. FACTORY TEST REPORTS

Factory tests shall be performed for each piece of equipment where specifically called for in the Section specifying that equipment. Note that factory tests are inherent in many reference standards. The requirement for a factory test in a referenced standard shall make that requirement a part of these Specifications. Conduct factory tests at the same speeds at which the equipment will operate in the field except as noted.

Where specifically noted, the Engineer may witness performance test. The Contractor shall inform the Engineer in sufficient time to allow arrangements to be made for witness of such tests. When non-witnessed tests are performed, certified results shall be supplied by the Contractor to the Engineer.

Factory testing of pumps shall be done in accordance with the requirements and standards of the Hydraulic Institute. Tests of other equipment shall conform to the requirements set forth in these Specifications.

F. IDENTIFICATION OF DELIVERED EQUIPMENT

Each piece of equipment delivered to the project site shall be accompanied by a completed form which will contain at least the following information:

- 1. Owner's name and location of project.
- 2. Contractor's name and subcontractor if applicable.
- 3. Name of item being submitted.
- 4. Specification reference by section, paragraph and page.
- 5. Data on item (manufacturer, general descriptive data, dimensions, size of connections, speeds, performance curves, serial number).
- 6. Motor data, type, voltage, frequency, phase, full load amperes, starting method, frame size, enclosure, insulation type, NEMA Code letter, dimensions, service factor, serial number.

7. Date and signature of person certifying performance.

G. MANUFACTURER'S AFFIDAVITS

Equipment manufacturers, or their authorized representatives, shall each submit a signed and dated written report with respect to their equipment certifying the following:

- 1. The equipment has been properly installed and lubricated
- 2. The equipment is in accurate alignment
- 3. The manufacturer was present when the equipment was placed into operation
- 4. The manufacturer has checked, inspected, and adjusted the equipment as necessary
- 5. The equipment is free from any undue stress imposed by connecting piping or anchor bolts
- 6. The equipment is not imposing any undue stress on any connecting members
- 7. The equipment has been operated satisfactorily under full load conditions
- 8. The manufacturer has inspected their equipment during the operational demonstrations and system validation tests to the extent specified
- 9. The equipment is fully covered under the terms of the guarantee

PART 2 PRODUCTS

2.1 DESIGN

All equipment shall be designed for the service intended, of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection and during continuous or intermittent operation, shall be adequately stayed, braced and anchored, and shall be installed in a neat and workmanlike manner. Appearance, safety, and utility shall be given consideration in the design of equipment. Materials of construction shall be cathodically compatible.

2.2 STANDARD REQUIREMENTS

A. MATERIALS

Design, fabricate and assemble equipment and systems with new materials and in accordance with acceptable engineering and shop practices. Manufacture individual parts to standard sizes and gauges so repair parts can be installed in the field. Make like parts of duplicate units interchangeable. Do not place equipment in service at any time prior to delivery except as required for factory or shop tests.

B. UNIFORMITY

Unless otherwise specified, equipment or material of the same type or classification used for the same purpose shall be the product of the same manufacturer and shall be the same model.

C. SEISMIC REQUIREMENTS

Supports and anchorage of equipment(s) shall comply with the requirements of the 2021 *International Building Code* (IBC) Section 1613 and ASCE 7-10 *Minimum Design Loads for Buildings and Other Structures*, Chapter 13 Seismic Design for Nonstructural Components, as referenced and amended by the IBC. For the following design parameters:

- Risk Category IV
- Site Class C
- The component Importance Factor: $I_p = 1.5$
- Design response acceleration coefficients:

$$S_{DS} = 1.247g$$

 $S_{D1} = 0.550g$

Seismic Design Category D

D. STANDARDS

Provide equipment and materials suitable for service conditions and meeting standard requirements of ANSI, ASME, AWWA, ASTM, NEMA, IBC, NPC, UL and OSHA.

2.3 LUBRICATION

Provide lubricants of types recommended by equipment manufacturers, in quantities sufficient for a minimum of 1-year's consumption prior to completion, testing and final acceptance.

2.4 EQUIPMENT BASES AND BEDPLATES

Mount equipment assemblies on a single heavy cast iron or welded steel bedplate on a grout or concrete base unless otherwise shown or specified. Provide bases and bedplates with machined support pads, vibration pads, tapered dowels for alignment or mating of adjacent items, adequate openings to facilitate grouting, and openings for electrical conduits. Corners shall be rounded or chamfered and ground smooth. Continuously weld seams and contact edges between steel plates and shapes, and grind welds smooth. Do not support machinery or piping on bedplates other than that which is factory installed. Provide leveling screws in equipment bases and bedplates to aid in leveling prior to grouting.

2.5 ANCHORS AND FASTENERS

Each equipment manufacturer shall furnish the required anchor bolts, nuts and washers of adequate design for securing bases and bedplates to concrete bases. Provide anchor bolts of length to allow for 1-1/2 inch of grout under baseplates and adequate anchorage into structural concrete unless otherwise shown or specified. The manufacturer shall submit to the Engineer design calculations regarding recommended sizing and type of anchor bolts, nuts, and washers for securing the equipment, in accordance with the project seismic requirements.

Anchor and assembly bolts and nuts shall be of ample size and strength for the purpose intended. All nuts, bolts and washers shall be Type 316 stainless steel. All leveling nuts shall be Type 316 stainless steel.

All motor-driven equipment shall be furnished with cast-in-place anchor bolts or drilled-in anchors set with epoxy adhesive. Do not provide expansion type anchors for motor-driven equipment, or equipment or piping subject to vibration.

Expansion type anchors are not to be used for any submerged applications unless specifically noted on the Plans.

Anchor all non-motor-driven equipment with cast-in-place anchor bolts or drilledin anchors set with epoxy adhesive except that, where specifically allowed by note on the Plans, expansion type anchors may be used.

2.6 SAFETY GUARDS

Cover belt or chain drives, fan blades, couplings, exposed shafts and other moving or rotating parts on all sides with safety guards conforming to all applicable Federal, State, and local codes and regulations; conform to the most restrictive requirement. Design guards for easy installation and removal, complete with necessary supports, accessories, and fasteners, all hot-dip galvanized. Design guards in outdoor locations to prevent entrance of rain and dripping water. Provide tachometer test opening in line with ends of shafts. Typically, guards shall be expanded metal on a structural steel frame except that outdoor guards may be of solid material. Provide spring loaded hinged doors with latch for service and lubrication access.

All pipes, manifolds, heaters, and other surfaces, which have a surface temperature sufficient to burn human tissue, shall be covered with a thermal insulating material or otherwise guarded against contact.

Guards shall comply with the requirements of these Specifications, WISHA Standards, and "The Principles and Techniques of Mechanical Guarding" (OSHA 2057, 1973), whichever is more stringent.

2.7 LIFTING EYES

All equipment weighing over 100 pounds shall be supplied with lifting eyes. Parts of equipment assemblies, which are normally serviced separately, such as motors, shall have individual lifting eyes.

2.8 ELECTRICAL COMPONENTS

Equipment shall be manufactured, fabricated and installed in a manner which permits conduit connection to electrical power and control equipment from below the connection point, terminal box, or connection box without offsets or bends such that the conduit will drain away from the equipment.

Electric motors, control panels, accessories, etc., shall conform to the requirements of Divisions 11, 12, 13, 15 (Equipment items) and Division 16, Electrical.

If any motor fails during the warranty period, the Contractor shall replace the motor with a new motor. Rewinding a failed motor shall not be acceptable.

All electrical components shall be recognized or labeled and listed by a recognized electrical testing laboratory for the application, or approved by the Washington State Department of Labor and Industries for installation on the Project.

2.9 MOTOR PROTECTIVE DEVICE COORDINATION AND DOCUMENTATION

The Contractor shall maintain a spreadsheet or database list of the motor characteristics that are necessary to size, select, and/or set the various motor protective devices, such as thermal overloads, breaker trip devices, motor protection relays, etc. This list shall also include any additional information needed to set-up, program or adjust the variable frequency drive which serves motor driven equipment such as minimum speed, acceleration, etc. The list shall be sent with each equipment submittal for motor driven equipment and shall be updated to reflect the motor information for the submitted equipment

The Contractor shall record the size and/or settings of each motor protective device at the time of startup and after any subsequent adjustments on the motor characteristics list described in the preceding paragraph.

In addition, the Contractor shall take a digital photo of each motor nameplate when the motor arrives at the jobsite. Each digital photo shall be emailed to the Engineer, noting any discrepancy between the motor nameplate data and the submitted motor data.

2.10 NAMEPLATES/DATA PLATES/IDENTIFICATION

Each piece of equipment and its driver shall be furnished with a stainless steel metal nameplate fastened to the item in an accessible position. This nameplate shall contain the manufacturer's name, equipment rating, capacity, size, model, serial number and speed. Data for motors shall be NEMA standard. All information written or printed shall be in English. Each item of equipment shall bear a different serial number. Measurement units shall be given for ratings and capacity.

Nameplates for tanks and pressure vessels shall give working pressure, test pressure, vessel plate thickness and ASME Code data.

Each piece of rotating equipment shall have a direction of rotation arrow.

Each piece of equipment shall be labeled using a plastic laminate label with the functional name and number of the equipment shown on the Plans or provided by the Engineer. Name and number shall correspond to those used on Motor Control Centers and Panels.

Labels shall be fastened to the equipment base or other acceptable location. The letters shall be at least 1/2-inch high with a border trim on all sides not less than \(^1\)4-inch. Color shall be green background with white letters. Fasteners shall be

brass or stainless steel screwed into inserts, anchor shields or tapped holes in equipment or base.

Units of measure shall be shown on the indicating and totalizing dials of all meters, gauges and other measuring devices.

2.11 PROTECTION AGAINST ELECTROLYSIS

Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjacent surfaces so as to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, non-metallic separators or washers. Connections of dissimilar piping materials shall utilize dielectric unions, flanges, couplings or bushings.

2.12 PAINTING

Painting of all equipment shall be in accordance with Section 09900 of these Specifications.

2.13 NOISE

Mechanical and electrical equipment shall not create sound levels that are in excess of that permitted by WISHA for 8 hours per day worker exposure unless otherwise noted for the specific piece of equipment involved.

2.14 VIBRATION AND CRITICAL SPEED LIMITATIONS

Mechanical and electrical equipment shall meet the vibration and critical speed limitation requirements described in Section 11010.

2.15 PRESSURE GAUGE CONNECTIONS

Provide tapped and plugged suction and discharge gauge connections on the pump nozzles or flanges. Where this is not possible, provide gauge connections on the piping immediately adjacent to the pump.

2.16 PUMP SEAL WATER

The Plans show a seal water system applicable to some pump installations. The Contractor shall review each pump installation with the pump manufacturer and shall provide seal water installations in strict accordance with the manufacturer's recommendations at no additional cost to the Owner.

PART 3 EXECUTION

3.1 INSPECTION

Inspect each item of equipment for damage, defects, completeness, and correct operation before installing. Inspect previously installed related work and verify that it is ready for new equipment installation.

3.2 PREPARATION

Prior to installing equipment, ensure that the areas are clean and that concrete or masonry operations are completed. Maintain the areas in a broom-clean condition during installation operations. Clean, condition, and service the equipment in accordance with the Operation and Maintenance Instruction Manuals and specific requirements included in applicable Sections of these Specifications.

3.3 SPARE AND LOOSE PARTS

Prior to equipment startup provide an inventory of spare and loose parts supplied under the project. Turn over inventory and parts to the Owner. The Owner's written acknowledgment of receipt is required for project completion. Loose parts are defined as items such as special tools, keys, safety equipment, and portable equipment.

3.4 INSTALLATION

A. EQUIPMENT

Equipment shall conform to the approved submittals and Operation and Maintenance Instruction Manuals. Employ skilled craftsmen experienced in installation of the types of equipment specified. Use specialized tools and equipment, such as precision machinist levels, dial indicators, gauges, and micrometers, as applicable. Produce acceptable installations free of vibration or other defects.

B. ANCHOR BOLTS

Deliver bolts with templates or setting drawings and verify that bolts are correctly located before structural concrete is placed. Prior to assembly, the Contractor shall coat all stainless steel bolts and nut threads with anti-seizing compound.

C. BASE AND BEDPLATE GROUTING

Do not place grout until initial fitting and alignment of connected piping is completed. Level and align equipment on the concrete foundations, then entirely fill the space under base or bedplates with grout. Bevel exposed grout at 45-degree angle, except around exposed grout at horizontal surfaces for drainage. Trowel or point exposed grout to a smooth, dense finish and damp cure with burlap for 3 consecutive days. When grout is fully hardened, remove jacking screws and tighten nuts on anchor bolts. Check the installation for alignment and level, and perform corrective work as required to conform to the tolerances given in the applicable Operation and Maintenance Instruction Manual.

The Contractor shall make an allowance of at least 1-1/2 inches for grout under the equipment bases, whether or not shown on the Plans. Shims used to level and adjust the bases shall be steel. Shims may be left embedded in the grout, in which case they shall be installed neatly and so as to be as inconspicuous as possible in the complete work. Unless otherwise authorized, all grout shall be a non-shrink, non-metallic grout as stated in Section 03300.

Where practicable, the grout shall be placed through the grout holes in the equipment base and worked outward and under the edges of the base and across the rough top of the concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around the top edge of the finished foundation.

D. PRESSURE GAUGES

Pressure gauges shall be installed on all pump discharge piping at a location where the gauges can be easily read. The gauges shall be located upstream of the isolation valves, if possible. Gauges shall be installed on other equipment items as specified. The gauges are specified in Division 13 and shall be installed as detailed on the Plans.

3.5 EQUIPMENT STARTUP AND ADJUSTMENT

The Contractor, at their own expense, shall arrange for an authorized factory-trained representative of the company or companies supplying the various items of equipment to:

- Supervise the equipment installation in accordance with the Operation and Maintenance Instruction Manual.
- Be present when the equipment is first put into operation.

- Inspect, check, adjust as necessary, and approve the installation.
- Repeat the inspection, check and adjust until all trouble or defects are corrected and the equipment installation and operation are acceptable.
- Witness and supervise operational demonstrations and system validation tests to the extent specified.
- Prepare and submit the specified Manufacturer's Affidavit.

The representative shall be experienced and knowledgeable regarding the equipment being tested.

The Contractor shall give initial lubrication to all equipment in accordance with the manufacturer's recommendations.

The manufacturer shall provide a formal test procedure and report forms for recording data. The Contractor shall submit the report forms to the Engineer prior to operational testing.

All equipment shall be field tested and demonstrated to the Engineer that proper operation and capacity have been fully complied with. For pumps, this shall include measurement of suction and discharge pressure at the pump and measurement of pumping rate by volumetric means, or through a suitably calibrated meter for two points on the performance curve. Current draw and voltage on the motor for each phase shall be measured for each pumping rate measurement. For two-speed pumps, such tests shall be conducted at both speeds. For variable speed pumps, blowers or fans, these tests shall be conducted at minimum and maximum speeds and at the specified duty point.

The Contractor shall furnish and test equipment or measuring devices (including portable flow meters) required that are not part of the permanent installation. Tests for variable speed pumps, blowers, and other equipment shall be performed at 60 Hz and at the initial anticipated flow or capacity levels.

The field test shall demonstrate under all conditions of operation that the equipment:

- Has not been damaged by transportation or installation.
- Has been properly installed.
- Has no mechanical defects.

- Is in proper alignment.
- Has been properly connected.
- Is free of overheating of any parts.
- Is free of vibration in excess of the limits in Section 11010.
- Is free of excessive noise.
- Is free of overloading of any parts.
- Shall operate as specified with the specified control system.
- Is free of critical speeds as specified in Section 11010.

In addition, the entire facilities shall be demonstrated to be in full operating order prior to the acceptance of the work. Should any equipment or part thereof fail to operate as intended, it shall be immediately removed and replaced, all at the Contractor's expense.

Equipment start-up and adjustment shall take place before instruction of the Owner's personnel is performed.

3.6 INSTRUCTION OF OWNER'S PERSONNEL

Conduct an instruction program for up to six operations personnel designated by the Owner in accordance with Specification Section 01800. Furnish the services of qualified instructors from the various equipment manufacturers for the duration specified in each specific Section. Include instruction covering basic system operation theory, routine maintenance and repair, and "hands on" operation of equipment.

Provide the instruction program at the Owner's convenience before contract closeout. The Contractor shall audio- and video-record all training sessions, and also provide the Owner with any audio-visual training materials the manufacturer utilizes (i.e., DVDs, PowerPoint presentations, videocassettes etc.). Cost of instruction and audio-visual training materials shall be included in the bid price for the equipment.

3.7 SOUND LEVEL TESTING

Measure the sound level developed by all mechanical and electrical equipment provided under the Contract Provisions. Perform testing in all rooms and spaces containing such equipment during the final operation test program with all equipment operating. Use OSHA approved instruments and record the highest sound levels developed when measured according to OSHA standards in each room and space. Deliver a certified copy of records to the Engineer.

*** END OF SECTION ***

SECTION 11010

VIBRATION AND CRITICAL SPEED LIMITATIONS

PART 1 GENERAL

1.1 SCOPE

This Section specifies vibration and critical speed limitations for rotating mechanical equipment. Individual equipment specification sections may specify more stringent requirements, which shall then govern. Field-testing and vibration measurements shall be taken on all rotating mechanical equipment.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
11000	Equipment General Provisions

1.3 SUBMITTALS

Manufacturer's certified calculations and data showing location of critical speeds in relation to operating speeds shall be provided in accordance with Section 01300, when specified in the individual equipment specification sections. The package booster station pump skid design shall include vibration and critical speed limitation analysis.

Where equipment is driven with a motor powered with a variable-frequency drive, the Contractor shall provide information on the limits and ranges of the vibration, torsion, mechanical, thermal, and similar characteristics of the driven equipment, where such limits or ranges impact the speed, time, or ramp settings of the variable-frequency drive. These points and ranges shall be included as part of the submittal information for the driven item of equipment. The purpose of this requirement is to allow coordination of the variable-frequency drive configuration with the limitations of the driven equipment.

1.4 VIBRATION LIMITATIONS

Vibration frequencies shall span the range from 5.0 to 5,000 Hz. Where specified, measurements shall be obtained while the installed equipment is operating within the specified speed range. These measurements shall be recorded and provided to the Engineer along with the Manufacturer's Affidavits.

A. CENTRIFUGAL

1. Machines with Sleeve Bearings: Unless otherwise specified, centrifugal machines with sleeve bearing shafts shall not exhibit unfiltered Root Mean Square (RMS) readings for vibration displacement in excess of the following:

Shaft speed range, rpm	Displacement, peak to peak, mils
Up to 900	3.5
901 - 1800	3.0
1801 - 3000	2.5
3001 - 4500	2.0
Above 4500	1.6

Displacement measurements shall be taken radially on the shaft at two points at each bearing. Measuring points shall be 90 degrees apart.

2. Machines with Antifriction Bearings: Unless otherwise specified, centrifugal machines with antifriction bearing shafts shall not exhibit unfiltered RMS readings for vibration velocity in excess of 0.12 inches per second. Velocity measurements shall be taken on one point of each bearing housing.

B. POSITIVE DISPLACEMENT MACHINES

Unless otherwise specified, positive displacement machines of the rotary, reciprocating and controlled volume types shall operate without any lateral or torsional vibration characteristics that may accelerate wear of the equipment. The Contractor shall provide manufacturer's certification that the manufacturer has inspected the machine under operating conditions and found it to comply with the requirements of this paragraph.

1.5 CRITICAL SPEED REQUIREMENTS

Unless otherwise specified, rotating mechanical equipment shall not exhibit critical speeds within the specified range of operating speeds. Critical speeds for equipment with rigid rotor systems shall be at least 20 percent greater than maximum operating speed or impeller blade pass frequency, whichever is greater. Critical speeds for equipment with flexible shaft-rotor systems shall be at least 15 percent below minimum operating speed and 20 percent above maximum operating speed or impeller blade pass frequency, whichever is greater.

*** END OF SECTION ***

SECTION 11265

SKID-MOUNTED BOOSTER PUMP STATION

PART 1 GENERAL

1.1 SCOPE

This Section of the specification covers the furnishing and installation of a skid-mounted booster station complete with controls.

The following items are a part of this Section and shall be furnished by one manufacturer and be supplied as a singular unit to ensure a properly designed and integrated modular booster pump system:

- A. Cornell pump and motor units each able to supply design flow at the required Total Dynamic Head (TDH).
- B. Pressure gauges and transducers on the suction and discharge headers.
- C. Electronic controls to operate pump station based on system pressure or reservoir level.
- D. All other valves and appurtenances as shown on the drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section Section	<u>Item</u>
01300	Submittals
09900	Painting
11000	General Requirements of Equipment
11010	Vibration and Critical Speed Limitations
Division 15	Mechanical
Division 16	Electrical

1.3 QUALITY ASSURANCE:

The skid-mounted booster station shall be furnished by a single manufacturer who shall comply with the following:

A. The single manufacturer supplying equipment to this specification shall furnish proof of a minimum of 15 similar installations and 10 years of experience manufacturing skid mounted booster stations as specified.

1.4 **SUBSTITUTIONS:**

Manufacturers other than that which is specified shall be required to submit a complete and detailed substitution request with the submittal package that must contain as a minimum:

- A. Detailed Layout Drawings.
- Detailed component specifications and catalog cut sheets for each В. component.
- C. Control and Instrumentation Diagram.
- D. Detailed list of variations required from original design, referencing appropriate sections of the specifications and locations on the drawings.
- E. History of the equipment offered, including similar installations elsewhere.
- F. All other data as required in Section 1.3 - Quality Assurance.
- G. A detailed System Performance Guarantee with appropriate remedies for Non-performance.

1.5 **SUBMITTALS**

In addition to the requirements of Section 01300 of these Specifications, the submittals for this equipment shall include the following:

- Certified general arrangement drawings showing all important details and A. materials of construction, dimensions, loads on the concrete slab, and anchor bolt locations.
- B. Descriptive literature, bulletins, and/or catalogs of the equipment.
- C. Complete data on motors, pumps, and equipment.
- D. Wiring diagrams and electrical schematics for all control equipment.
- E. Detailed instrumentation and control diagrams of all components.

1.6 COMPONENTS

The skid-mounted booster station package shall be supplied with the following minimum components:

Equipment Name	Equipment Tag No.
Booster Pump 1	03 BP 01
Booster Pump 2	03 BP 02
Check Valve Pump 1	03 V 01
Check Valve Pump 2	03 V 02
Pressure Relief Valve	03 PRV 01
Pressure Transducer	03 PT 01
Pressure Transducer	03 PT 02
Pressure Gauge	03 PG 01
Pressure Gauge	03 PG 02
Control Panel	03 CP 01

In addition, each pump shall be provided with an isolation butterfly valves on the suction and discharge piping, as well as all other appurtenances as indicated on the plans.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURER

The skid-mounted booster bump station shall be manufactured by PumpTech, LLC, or approved equal (subject to the provisions of Section 1.4).

2.2 GENERAL

Booster station shall be NSF 61 certified of the entire system. Individual certification of components and coatings will not be approved for potable water use through NSF 61

A. Furnish and install a duplex skid-mounted booster station with 03 BP 01 and 03 BP 02 (duty pumps) meeting the following design criteria:

	Flow	
Design Criteria	(gpm)	Total Head (ft)
Shut off	0	165
Design operating point	140	130

2.3 SKID-MOUNTED BOOSTER STATION COMPONENTS

All booster station components listed below shall operate as a unit and be incorporated into the skid-mounted booster station. Electrical and control equipment may be provided on a separate dedicated skid and hardwired to the pump skid.

A. PUMPS

Pumps shall be horizontal closed coupled centrifugal by Cornell, or approved equal.

Standard pump materials shall be as follows:

Component(s)	Material
Volute and Backplate	Cast iron
Shaft Sleeve	Bronze
Impeller	Bronze
Wear rings	Bronze
Standard Seal	Carbon vs. Ceramic with Brass

Optional materials for the suction/discharge base and pump head shall be cast 316 stainless steel (ASTM CF-8M) resulting in all wetted parts of stainless steel.

B. MOTORS

The pump motors to be provided by the pump manufacturer and suitable for use with VFD starters.

Motors shall be labeled and listed by a recognized electrical testing laboratory for the application, or approved by the Washington State Department of Labor and Industries for installation on the project.

C. BUTTERFLY VALVES

Each pump shall be provided with a butterfly valve on its suction and discharge side for isolation. Butterfly valves for liquid service sizes 2 inch and larger shall be a full lug style butterfly valve. The valve disk shall be nylon coated ductile iron. The valve seat material shall be EPDM and the body shall be ductile iron, coated internally and externally with fusion-bonded epoxy. The entire assembly shall be factory assembled and tested. Liquid service butterfly valves shall be Bray series 31, or equal. Valves shall be rated for at least 175psi.

Where butterfly valves are installed adjacent to check valves or other fittings, which interfere with the valve's full range operation, flange fillers, or other spacers, shall be installed between the valve and the obstructing fitting as necessary to ensure unrestricted operation of the butterfly valve from full open to closed.

D. CHECK VALVES

Check valves greater than 2" shall be a wafer style silent check valve. The valve shall have poppet design which ensures that the valve operates quietly and efficiently throughout the entire stroke of the poppet due to varying flow rates. The valve design shall incorporate a center guided, spring loaded poppet, guided by an oversized, one-piece bushing. The poppet shall have a short linear stoke that generates a flow area equal to that of the pipe size in the full open position. Valves shall be certified to NSF/ANSI 61 Drinking Water System Components - Health Effects, and also certified to be lead free in accordance with NSF/ANSI 372. Valve body shall be ductile iron with EPDM rubber seal.

E. PIPING

All skid mounted piping shall be NSF 61 certified fusion bonded powder coating or 316 stainless steel. All pipe and fitting shall be rated for at least 175. Flange gaskets shall be NSF approved Toruseal or Garlock.

F. PRESSURE MEASUREMENT

A bourdon tube pressure gauge, 2.5 inch diameter, shall be placed on the suction and discharge manifolds. The gauge shall be liquid filled and have stainless steel internal parts in a stainless-steel case. Gauge accuracy shall be 2-1/2 percent. The gauge shall be capable of a pressure of 30 percent above its maximum span without requiring recalibration. The pressure gauges shall be glycerin filled and shall have all internal parts immersed. Pressure gauges shall be minimum 4-1/2-inch dial size, with black metal cases and stainless-steel bourdon tubes. The pressure gauge ranges shall be selected based on the anticipated working pressures of the lines to which they will be attached. All pressure gauges shall be fitted with 316 stainless steel pressure snubbers and isolation valves. Gauges shall be ANSI Grade A or better with an accuracy of +/ 1 percent over their full range.

A pressure transducer as specified herein shall be provided on the pump suction and the pump station discharge. The suction pressure transducer pressure sensitive element shall be 316 stainless steel and shall be calibrated for pressures ranging from 0-30 psi. The discharge pressure sensitive element shall be 316 stainless steel and shall be calibrated for pressures ranging from 0 psi to 250 psi.

The unit shall include fully adjustable span, zero, suppression, and elevation adjustments. The electronic transducer shall be strain gage, capacitance, or mechanical resonance type. The transducer shall be

"smart," with configuration and calibration possible through keys internal to the transducer. No external devices shall be required for these functions.

The transducer shall be capable of deriving operating power from the 4-20 milliamp current loop with no auxiliary power supply (a "two-wire transmitter"). The transducer shall be capable of operating at 20 mA with a minimum of 12.5 VDC at the transmitter and shall be capable of regulating loop current with up to 42 VDC applied. Measurement accuracy shall be $\pm 0.5\%$.

G. PUMP STATION CONTROLS

The face of the control panel shall have a physical Hand-Off-Auto switch for each pump, speed potentiometer for each, and a physical run-time meter for each pump.

The panel shall provide the following control functions:

- 1. Each pump whose HOA is in the Auto position shall be assigned a Lead or Standby position. The Lead/Standby position of the pumps shall be alternated each time the pumps run. The operator shall be able to assign the Lead/Standby position of the pumps using the Operator Interface.
- 2. In the event of a pump station alarm condition (pump fail), the panel shall signal an alarm.
- 3. In the event of a low pump suction pressure alarm, the Lead pump shall be shut off for a period of 2 minutes. If the low suction pressure clears itself during this period, the Lead pump shall restart. If the low pump suction pressure alarm occurs 3 times in 15-minute period, the alarm shall latch and require a manual reset.
- 4. On loss of power the panel shall signal an alarm.
- 6. The panel shall be provided with separate Alarm outputs for each of the alarms described in the above section. Contractor shall be able to connect to these alarms from the field side of a terminal strip in the panel.
- 7. The panel shall be provided with a switched, dry, relay contact for future chemical metering. Program output relay to close when any pump is running. Contact shall be rated to switch 10A at 120V (min), install buffer relay in panel if required.

The panel shall be provided with a color touchscreen operator interface (5.5") that displays the following:

- 1. Pump status for each pump.
- 2. Lead/Standby position for each pump.
- 3. Alarm Status for each individual alarm.
- 4. Run Time for Each Pump.
- 5. Pump Station Suction and Discharge Pressure.
- 6. The interface panel shall provide a screen with an alarm log and a screen with an event log.

Control Circuitry:

The controller shall be Programmable Logic Controller (PLC) based with Ethernet connectivity.

Controller architecture shall allow for analog and digital (I/O) interface with ISA or other industry standard transducers, actuators, and communication equipment without the need for intermediate conditioning devices.

The control panel shall be equipped with indicators for the following parameters:

- 1. Motor Run-Time indictor that cannot be reset from the front panel.
- 2. Motor On/Off Indication

Panel Nameplates:

Each item on the control panel shall be provided with a rectangular nameplate. This nameplate shall identify the item with ½-inch high lettering and provide the pertinent tag number in ¼-inch high lettering. All nameplates shall be installed level and plumb and secured to the panel with adhesive or sheet metal screws. Abbreviations are not permitted on nameplates.

Other Panel Components:

The control panel shall be equipped with a surge and lightning arrestor and shall be "Safe Wired" such that stopping of equipment results from deenergization of control circuits, rather than energization of control circuits.

H. SKID FRAMEWORK

The skid shall be constructed of steel and provide suitable anchorage points for bolting the unit to a concrete slab.

I. PAINTING

The entire skid mounted booster station shall be coated in accordance with Section 09900 of these specifications.

J. GROUNDING AND BONDING

The entire skid mounted booster station shall be in accordance with Section 16060 of these specifications.

K. WIRING DEVICES

The entire skid mounted booster station shall be in accordance with Section 16140 of these specifications.

L. ENCLOSED SWITCHES AND CIRCUIT BREAKERS

The entire skid mounted booster station shall be in accordance with Section 16410 of these specifications.

M. MOTOR CONTROLLERS

Pump station control panel shall contain a complete VFD motor starter for each pump. Each starter shall be comprised of a motor starter circuit breaker for overcurrent protection, motor overload protection, and lockable disconnect.

N. VARIABLE FREQUENCY DRIVES (VFDS)

1. The control panel shall be equipped variable frequency drives (VFD) on all pumps & motors. 6 pulse minimum VFD shall be isolated from main input power by use of a contactor to protect the VFD from power outside of tolerances.

- 2. The variable frequency drive shall be IGBT based with selectable carrier frequency up to 15 KHZ. The VFD shall include terminals for incoming power, motor output power and control terminals. All VFDs shall include an RS485 or ethernet port built-in to the VFD for dedicated communication to the PLC.
- 3. The VFD shall generate a sine-coded, variable voltage/ frequency, three phase output for optimum speed control. The VFD shall incorporate power loss ride-through for a minimum of 2 seconds. VFD protective features shall include current limit, auto restart, short circuit protection, electronic motor overload protection, and ground fault protection. The VFD shall have a push button programming display for easy access to operation parameters. The VFD shall be protected on the primary side by a breaker of the appropriate amperage.
 - a. Overload capacity: 120% rated output current for one minute.
 - b. Voltage fluctuation: +10%, -15%.
 - c. Sine wave, PWM, with full range, and automatic torque boost.
 - d. Frequency control range: 0.5 to 500 Hz.
 - e. Frequency accuracy: digital, 0.01 Hz, analog, .1%. Motor overload protection, instantaneous over current of 180% of rated output current.
 - f. Over voltage at 820vdc if 460v input.
 - g. Under voltage shall be user-adjustable.
 - h. Momentary power loss: up to 2 second ride through.
 - i. Electronic ground fault.
 - j. Led capacitor charge indicator.
 - k. Input phase loss alarm.
 - 1. Ambient temperature range of 0 to 50 degrees C.
 - m. Humidity of 95% non-condensing.

- n. Manufacturer: ABB ACS550 Series, ABB ACS580 Series, Mitsubishi F800 series, Schneider Altivar ATV630 series, or approved equal.
- 4. VFDs shall be provided with line and load reactors or DC chokes. Filters integral to the drive shall be acceptable.

O. AVAILABLE POWER

Pump station control panel shall be given a single 50 480/277V 3-phase circuit (3x #8AWG, 1x #10G). Contractor shall be provided a place to terminate these conductors on a lockable disconnect which is provided as part of the skid. All power required on the skid, shall be derived from this one connection by the skid manufacturer, i.e., the skid manufacturer is responsible for any and all control transformers and power supplies that may be required by their design.

2.4 SPARE PARTS

One set of manufacturer's spare pump parts shall be provided in labeled, wood boxes, with moisture protection and contents labeled for each pump. The following spare parts shall be provided and stored in protective containers.

Gaskets 1 set
Mechanical seal 1 each
Stack Kit 1 each

PART 3 EXECUTION

3.1 PREASSEMBLY

The skid mounted booster station will be entirely factory preassembled with all components integral to the mounting skid. Installation will be by contractor and requirements will include proper location and anchorage of the unit on the jobsite base pad, and completion of electrical and piping connections to and from the unit. Anchorage and all connections to piping shall be made as indicated on the drawings.

3.2 DELIVERY OF EQUIPMENT

Equipment supplied under this section shall not be delivered to the site until construction has progressed to the point where installation may properly commence.

3.3 INSTALLATION

- A. The Skid Mounted Booster System shall be installed as shown on the Contract Drawings and specified herein.
- B. The skid shall be set on an asphaltic mastic compound on the concrete equipment pad. The skid shall be anchored to the equipment pad per the manufacturer's recommendations.
- C. The Manufacturer shall inspect the installation of all equipment in this section prior to start-up in order to verify that the equipment has been properly installed and operates properly as a system.
- D. The Manufacturer after the equipment has been properly installed shall calibrate the equipment with the Owner's operator present.

3.4 OPERATIONAL CONTROL

Pump operation shall be controlled using system pressure. For the two duty pumps, the Programmable Logic Controller (PLC) shall be configured as a "lead-standby" setup, alternating pump demand between the two pumps.

3.5 TESTING AND TRAINING

The Installing Contractor shall monitor equipment operation for a 48 hour operating period to demonstrate that the equipment has been properly installed and will function as specified herein. An Equipment Manufacturers Representative will be available onsite to provide assistance 12 of every 24 hours for the initial monitoring period. In the event that the system fails to operate automatically the Installing Contractor will correct the problem and retest for 48 hours

After start-up, the Manufacturer shall furnish the service of a competent technical service representative one month after Contractor's start-up to instruct the Owner's personnel in the operation and maintenance of the equipment for a period of one day.

All costs for start-up, testing, and training services shall be included in the cost of the booster pump package.

*** END OF SECTION ***

DIVISION 13 SPECIAL CONSTRUCTION

SECTION 13212

CONCRETE RESERVOIR

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the furnishing of all materials, labor, and equipment for the construction of a concrete water storage reservoir with concrete cover and interior supports as required.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
02510	Testing and Disinfection
03200	Concrete Reinforcement
03300	Cast-in-Place Concrete
Division 5	Metals
08310	Metal Access Hatches

1.3 SUBMITTALS

Submit under provisions of Section 01300.

A. CONCRETE

For concrete products, comply with Section 03300.

B. SHOP DRAWINGS

- 1. Plans and/or elevations locating and defining all material furnished by manufacturer, including dimensions and finishes.
- 2. Sections and details showing connections, cast-in items and their relation to the structure.
- 3. Sections and details to indicate quantities and position of reinforcing steel, anchors, inserts, etc.
- 4. Description of all loose, cast-in and field hardware.

C. RESERVOIR DESIGN CRITERIA

- 1. Loadings for Design
 - a. All dead and live loads as specified.
 - b. All other loads specified for member, where applicable.
- 2. Reservoir design calculations shall be performed and stamped by a structural engineer registered in the State of Washington experienced in the work under this Section.

1.4 DESIGN REQUIREMENTS

Design, fabricate, erect, inspect, and test in accordance with the 2021 International Building Code (IBC), except as modified herein.

Railings and ladders shall be designed in conformance with applicable safety and building codes, including OSHA, WISHA and the IBC.

Capacity: 200,000 U.S. gallon

Diameter: 30'- 0"

Reservoir Shell Height: 40'-0"

Minimum Wall Thickness: 12"

Vertical Loads

Dead Load: Actual Roof Live Load: 20 psf

Snow Live Load: As required by local jurisdiction

Water Live Load: 62.4 pcf

Platform and Landings

Live Load: 150 psf

Design earthquake load in accordance with ASCE 7-10 Section 15.7.6. "Ground-Supported Storage Tanks for Liquids."

A. LATERAL FORCES

- 1. For wind loading conditions, the overall stability of the reservoir shall be designed to resist forces generated by the requirements for wind per ASCE 7-16.
- 2. Wind

Ultimate Wind Speed = 110 mph, 3-second gust

3. Seismic

Evaluate the seismic loads according to ASCE 7-16 with the following parameters:

$$\begin{split} S_s &= 1.558g \\ S_1 &= 0.581g \\ I &= 1.5 \\ S_{DS} &= 1.247g \\ S_{D1} &= 0.550g \end{split}$$

B. SOIL BEARING PRESSURE

Soil bearing pressure has been determined to be 5,000 psf.

1.5 QUALITY ASSURANCE

The concrete tank suppliers shall have furnished and erected at least ten similar concrete tanks within the last 5 years of at least 250,000 gallons in capacity. A letter shall be submitted by the apparent low bidder within 48 hours after the bid opening listing ten such tanks, including name of owner, capacity, location, year completed, and telephone number of owner or owner's consultant.

1.6 GUARANTEE

The Contractor shall guarantee the complete tank and all items related thereto against defective materials and workmanship for a period of 2 years after date of acceptance by the Owner. Any defective materials or workmanship shall be replaced by the Contractor, at his/her expense, immediately upon notification by the Owner.

PART 2 PRODUCTS

A. APPROVED MANUFACTURER

The concrete reservoir shall be manufactured by Mt. Baker Silo of Lynden, WA, or pre-approved equal. To be considered an equal manufacturer, proposed manufacturers shall submit and receive approval no less than 10 days prior to bid date.

B. CONCRETE

All concrete products shall comply with Section 03300.

C. REINFORCING STEEL

Reinforcing steel shall comply with Section 03200.

D. WATERSTOPS

Provide waterstops in construction joints of all water containment structures and where shown on the Plans. Install waterstops to form continuous diaphragm in each joint in accordance with manufacturer's recommendations. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions and recommendations. All waterstops shall be tied into place using hog rings and/or tie wire to keep the waterstop from moving during placement of concrete. Provide manufacturer's written warranty for all waterstop installations.

E. ACCESSORIES

Provide the following accessories:

1. Ladders

Provide inside and outside ladders at the locations shown on the Plans. Ladders shall be hot-dip galvanized after fabrication. The ladders and landings shall be designed to be in compliance with WAC 296-24. Ladders shall be furnished with fall restraint system, Saf-T-Climb or equal. Two safety harnesses shall be provided with the fall restraint system.

2. Guardrailing

Provide guardrailing on reservoir roof as shown on the Plans, and as specified in Section 05500.

3. Roof Hatch

Roof access hatch shall be ASTM A36 steel and hot-dip galvanized after fabrication and as shown on the Plans. Access hatch shall be Halliday F1R series or equal. Hatch shall have 0.25-inch thick tread plate cover and frame extrusion, stainless steel hardware and hold open arm, hinged lockable protection, pressure locks, and an EPDM gasket cushion on the cover and under frame perimeter.

Roof Vent.

Provide one circular removable mushroom-shaped roof vent located at the center of the reservoir, as shown on the Plans as manufactured by Newlin, Inc. (Montezuma, Indiana ((765) 245-2741) or approved equal. The vent shall be of adequate size to handle pressure differential caused by water entering or leaving the tank at a maximum rate of 1,000 gpm with 30 percent of the vent screen blocked. The open area of the overflow shall not be considered as venting area. The Contractor shall provide a special screened vent to ensure fail-safe operation, in the event the screen frosts over or is otherwise clogged. The vent shall be easily dismantled to remove the screens for cleaning. The vent shall be screened with No. 24 mesh stainless steel screen and properly attached to prevent insects, water or other contaminants from entering.

5. Overflow

Provide an overflow as shown on the Plans.

6. Pipe Connections

Provide inlet, outlet, overflow, and drain connections, as shown on the Plans.

7. Water Level Indicator

Provide a water level indicator or "telltale" with a metal indicator board painted white with black numerals marked on even foot marks with numbers arranged from "0" to "Full Water" depth or height. The numbers on the gauge board shall be approximately 6-inches high. The gauge board length shall be 1/2 the water depth. The necessary pulleys to obtain this 2:1 ratio (water depth to the indicator length) shall be located on the reservoir exterior. The operating cable shall be enclosed pipe with pulleys. The cable shall be 5/32-inch-diameter stainless steel.

F. PRODUCTS IN CONTACT WITH POTABLE WATER

All products in contact with potable water, including form release and curing compounds, shall be ANSI/NSF 61 certified for potable water use.

PART 3 EXECUTION

3.1 CONCRETE

All concrete products shall comply with Section 03300, except the following:

A. FINISHES

1. Surface Finishes

All finished or formed surfaces shall conform accurately to the shape, alignment, grades and sections as shown on the Plans. Surfaces shall be free from fins, bulges, ridges and offsets, honeycombing or roughness and shall present a finished continuous hard surface.

2. Wall Surfaces

Steel forms shall be used on all wall pours. Forms shall not leak excessive amounts of mortar or yield beyond specific tolerances when the concrete is vibrated. Rock pockets, honeycombed areas, form tie holes, and any holes over 1/2-inch deep shall be repaired. No sacking or hand-rubbing will be required on any concrete finishes.

Allowable tolerances for concrete surfaces shall be classified as "abrupt" and "gradual." Offsets caused by displaced or misplaced forms and form alignment shall be considered as abrupt irregularities. All others are classed as gradual irregularities. Allowable tolerances are the same for both slabs and walls, and are as follows:

- Abrupt 1/2" a.
- Gradual 1" b.

3. Base and Roof Surfaces

All slab finishes shall have a "non-slip broom" finish, to prevent slippery surfaces. The concrete "non-slip broom" finish shall be uniform in texture, relatively free from screed/float marks, and shall comply with Section 03300. The under side of the roof shall be a rough form finish as results from the use of plywood forms. Roof shall be a minimum slope of 1:12 after 30 days cure.

3.2 **LADDERS**

Install fall restraint system as shown on the Plans and in accordance with manufacturer's recommendations.

3.3 **DISINFECTION AND TESTING**

The reservoir shall be disinfected and tested after all interior accessories are in place. Methods and procedures for disinfecting the reservoir shall conform to AWWA C652, Disinfection of Water-Storage Facilities.

The use of chlorine solution (sodium hypochlorite) or dry chlorine (calcium hypochlorite) is anticipated as the active disinfecting agent. Contractor shall be responsible for safe and proper handling and storage of chlorine compounds or other hazardous chemical that are used to perform this work. Handling of such chemicals shall be in accordance with chemical manufacturer's instructions and federal, state and local regulations. Other hazardous chemicals shall be used only after acceptance by the Engineer and Department of Health.

The intent of this section of the specifications is for the passage of bacterial and odor tests, protection of materials, health/safety and conservation of water. To achieve these requirements the Contractor shall submit written procedures and plans for disinfection of the reservoir and collecting samples to be tested by an independent laboratory. The submittal shall include:

- 1. Type of disinfection solution and method of preparation.
- 2. Method of disposal for disinfecting wastewater.

Before disinfecting, isolate the reservoir to prevent contamination of the distribution system. Remove all scaffolding, planks, tools, rags and other material not part of the structure or operating facilities of the reservoir. Clean the interior surfaces (walls, roof, beams and floor) with a pressure washer to remove dirt, oils

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and other foreign materials. Contractor shall be careful not to damage the structure or the new coating system in preparing the reservoir for disinfection. Disposal of water used to clean the interior of the reservoir shall be done before disinfection in accordance with applicable regulations. All water, dirt and foreign material accumulated in this cleaning operation shall be discharged from the reservoir or otherwise removed. This foreign material may be discharged out the drain piping, but shall be captured in the drainage basin and disposed to waste.

Disinfect all interior surfaces of the reservoir in accordance with the following method:

Spray or brush a solution containing 200 ppm of available chlorine onto the interior surfaces of the reservoir as prescribed in AWWA C652 Method 2. Apply solution from the bottom up and to include the entire surface area of the reservoir. Allow to remain 30 minutes or until dry before being rinsed off. Drain, dechlorinate, and dispose of all cleaning water. Fill reservoir with potable water as specified in AWWA C652.

Prior to disinfecting the reservoir, the Contractor shall schedule with the Owner to collect and analyze water samples.

After the reservoir has been cleaned, disinfected and filled with potable water, the Owner will take water samples and have them analyzed for presence/absence of total coliform and offensive odors. Sampling requirements are as follows:

- 1. After 48 hours a minimum of two samples shall be obtained and analyzed by standard procedures outlined by state and local regulatory agencies after at least 10,000 gallons are allowed to flush from the reservoir.
- 2. Sampling points shall be representative.

If satisfactory results are shown in the presence/absence test for total coliform, then the reservoir may be placed in service. If unsatisfactory results are shown in the presence/absence test for total coliform, repeated sampling and testing shall be done until two consecutive samples are satisfactory or the reservoir shall again be subjected to disinfection.

Watertightness tests shall be made at the time that the reservoir is being disinfected after the concrete has obtained at least 90 percent of its required 28-day compressive strength, but in no case sooner than 20 days after placing. Watertightness tests shall consist of filling the tank to the overflow with potable water after plugging outlets as necessary and allowing the tank to remain full for 72 hours.

Maximum allowable water surface drop after correction for evaporation shall be 0.10 inch during the final 24 hours of the test.

Leakage testing shall not be conducted during periods of time with measurable precipitation. Evaporation correction shall be made on the basis of an evaporation pan.

Watertightness testing may follow backfill of the structure, at the Contractor's option. However, if the structure does not pass the test, re-excavation to locate leaks will be required.

If a joint is not watertight after construction, the Engineer will require the repair to be by epoxy adhesive injection. Adhesive shall be Concresive 1380/Structural Concrete Bonding Process, which is a product, and process of the Adhesive Engineering Company, or equal. Epoxy adhesive injection shall be performed in strict accordance with the manufacturer's Guideline Specification. Concrete bonding and adhesives used to assure water-tightness of the structures must be listed by NSF as conforming to Standards 60/61.

The Owner will provide the water to fill the reservoir one time. Any additional water required due to failure of the disinfection or leakage tests shall be paid by the Contractor.

*** END OF SECTION ***

SECTION 13422

FLOAT SWITCHES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes furnishing and installing float switches and associated equipment as shown on the Plans and as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01800	Testing, Commissioning and Training
11000	Equipment General Provisions
Division 16	Electrical

1.3 EQUIPMENT LIST

Equipment numbers are as follows:

<u>Item</u>	Equipment Number
High Level Float Switch Reservoir 1	02 LS 01
Pump Off Float Switch Reservoir 1	02 LS 02
Pump On Float Switch Reservoir 1	02 LS 03
Low Water Alarm Float Switch Reservoir 1	02 LS 04
High Level Float Switch Reservoir 2	02 LS 05
Pump Off Float Switch Reservoir 2	02 LS 06
Pump On Float Switch Reservoir 2	02 LS 07
Low Water Alarm Float Switch Reservoir 2	02 LS 08

1.4 DELIVERY, STORAGE AND HANDLING

All equipment shall be completely factory assembled, crated and delivered to protect against damage during shipment. All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

1.5 WARRANTY

In addition to the warranty required in the General Conditions, the equipment manufacturer shall provide an extended warranty covering defects in material and workmanship for 2 years following the date of substantial completion. The

warranty shall be in printed form, shall apply to all similar units, and shall include parts and labor.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

The float switches shall be Flygt Model ENM-10 or approved equivalent equipment manufactured by Warrick Controls, Hydr-O-Matic, or Anchor Scientific.

2.2 FLOAT SWITCHES

Float switches shall be the tilting, non-mercury type. The switch shall be enclosed in a liquid-tight plastic casing with a cable of sufficient length to reach to the terminating device. Float switches shall have either single pole double throw contacts, or single pole single throw contacts. Pole and throw contact number will be determined based on recommendations of the Manufacturer as well as the application for which it will be used.

Mercury switches are not acceptable.

2.3 FACTORY TESTING

The equipment shall be fully tested at the manufacturer's plant before shipment. Tests shall insure that the equipment will operate as desired under anticipated field conditions. Certified copies of test report(s) shall be submitted to the Engineer prior to shipment.

PART 3 EXECUTION

3.1 INSTALLATION

The float switches shall be installed as shown on the Plans and in strict accordance with the manufacturer's recommendations. The float switches shall be mounted and positioned according to the manufacturer's approved method and at heights as directed by the Engineer (where heights are not indicated on the Plans). It shall be suspended at the proper position to hang or float, depending on the liquid level.

The electrical cable, supplied with the float, shall be connected from the float to the terminating device terminal.

3.2 FIELD TESTING

The Contractor shall perform the field testing described in Sections 01800 and 11000.

The field test shall insure that the equipment will operate as desired under field conditions. The manufacturer shall provide a formal test procedure and report forms for recording data. The Contractor shall submit the report forms to the Engineer prior to operational testing.

Any defects in the equipment or failure to meet requirements of the Specification shall be promptly corrected by the Contractor.

3.3 MANUFACTURER'S SERVICES

The services of a factory-trained representative of the float switch Manufacturer shall be provided. Services shall include a minimum of 1 day onsite. Services shall include inspection of the installation, initial configuration, programming, startup, and adjustments and instruction of the Owner's personnel in operation and maintenance. Instruction and training of the Owner's personnel shall not take place until startup is completed and the float switches are fully operational and shall be at a time and location agreed to by the Owner. The cost of these services shall be included in the bid price.

The representative shall provide for two additional service calls during the initial 2 years of equipment operation.

*** END OF SECTION ***

SECTION 13424

LEVEL TRANSMITTERS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes furnishing and installing pressure submersible level transmitters as shown on the Plans and as specified herein. The pressure transmitters shall include all necessary associated equipment, accessories, and hardware for a complete and workable installation.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01800	Testing, Commissioning and Training
11000	Equipment General Provisions
Division 16	Electrical

1.3 EQUIPMENT LIST

Equipment numbers are as follows:

<u>Item</u>	<u>Equipment Number</u>
Reservoir 1 Level Transmitter	01 LT 01
Reservoir 2 Level Transmitter	01 LT 02

1.4 PERFORMANCE REQUIREMENTS

The submersible level transmitter and transducer level signal shall indicate to ± 1 percent of value from 10 percent to 100 percent of scale and shall be within ± 1 percent of span below 10 percent of scale.

The analog instrumentation shall have an accuracy of ± 0.5 percent of full scale output.

The pressure transmitters shall be provided with the following pressure range for the specified application and location.

Pressure Transmitter	Pressure Range
02 LT 01	0 - 40 feet
02 LT 02	0 - 40 feet

1.5 DELIVERY, STORAGE, AND HANDLING

All equipment shall be completely factory assembled, crated and delivered to protect against damage during shipment.

All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

1.6 WARRANTY

In addition to the warranty required in the General Conditions, the equipment manufacturer shall provide an extended warranty covering defects in material and workmanship for 2 years following the date of substantial completion. The warranty shall be in printed form, shall apply to all similar units, and shall include parts and labor.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

The Submersible Level Sensor shall be as manufactured by Siemens Control Systems, Model A1000i or equivalent equipment manufactured by Contegra, Inc. No other manufacturers or models shall be accepted.

2.2 PRESSURE TRANSDUCER

The submersible level transducer shall be a two-wire type and shall operate from a supply voltage of 9 to 30 VDC and produce a 4-20 mA signal in direct proportion to the measured level excursion over a pre-calibrated range per Part 1.4. The unit shall have ample instrument loop load capacity and shall be able to drive a minimum load of 750 Ohms @ 24 Vdc loop power. The sensor technology shall be based on the use of a highly reliable and stable piezo-resistive pressure element with a 0.25 percent full scale accuracy with compensation for non-linearity, hysteresis and repeatability. The unit shall operate between –40 and 185 degrees F and shall have no more than a 3 percent full scale error over a –4 to 180 degrees F range.

The transducer element shall incorporate high over-pressure protection and be designed to withstand intermittent overpressures two times the full-scale range being sensed. Sensing principles employing less reliable technologies including LVDTs, capacitance or pneumatic elements shall not be acceptable. Metallic diaphragms are not acceptable.

The transducer shall be suitable for continuous submergence and operation.

The transducer housing shall be fabricated of Type 316 stainless steel with a 2-5/8-inch-diameter bottom diaphragm of heavy-duty, limp, foul-free, molded Teflon (TM) bonded to a synthetic rubber back/seal.

Transducers/transmitters that have the span and offset adjustments and electronics in the lower sensing portion of the transducer are not acceptable.

The internal pressure of the lower transducer assembly shall be relieved to atmospheric pressure through a heavy-duty urethane jacketed hose/cable assembly and a slack PVC bellows mounted in a weatherproof, fiberglass upper assembly. The sealed breather system shall compensate for variations in barometric pressure and expansion and contraction of air due to temperature changes and altitude as well as prevent fouling from moisture and other corrosive elements.

The sensor shall be suspension-mounted using a Siemens cable suspension mounting kit or approved equivalent, consisting of a 2-foot-long, 1-inch NPT Type 316 stainless steel pipe with coupling, bolt, cable clamps and hardware along with the required length of 1/8-inch diameter 7 x 19 stainless steel cable.

The level sensor shall be listed and labeled by a recognized electrical testing laboratory or be acceptable to the Washington State Department of Labor and Industries for installation on this project.

2.3 SPARE PARTS

The manufacturer shall supply one spare transmitter that will be identical to the equipment specified above. All spare parts shall be suitably identified and effectively protected from moisture and corrosion with appropriate wrappings or coatings or a combination thereof. All parts shall be furnished in sturdy labeled boxes.

2.4 FACTORY TESTING

The equipment shall be fully tested at the manufacturer's plant before shipment. Tests shall insure that the equipment will operate as desired under anticipated field conditions. Certified copies of test report(s) shall be submitted to the Engineer prior to shipment.

PART 3 EXECUTION

3.1 INSTALLATION

The equipment specified in this Section shall be installed as shown on the Plans and in accordance with the manufacturer's instructions and recommendations.

The level transducer shall be permanently mounted at the measuring site and positioned according to the Manufacturer's approved method. The bottom diaphragm face of the sensor shall be installed 12 inches above the bottom of the reservoir, unless otherwise shown on the Plans. The sensor shall be mounted using the stainless steel cable system as shown on the Plans.

The electrical signaling cable, supplied by the sensor, shall be connected from the sensor to the transmitter housing with an additional length of 5 feet to be coiled at the access hatch. No splices shall be allowed to the manufacturer's cable.

3.2 FIELD TESTING

The Contractor shall perform the field testing described in Sections 01800 and 11000.

The field test shall insure that the equipment will operate as desired under field conditions. The manufacturer shall provide a formal test procedure and report forms for recording data. The Contractor shall submit the report forms to the Engineer prior to operational testing.

Any defects in the equipment or failure to meet requirements of the Specification shall be promptly corrected by the Contractor.

3.3 MANUFACTURER'S REPRESENTATIVE

The services of a factory-trained representative of the pressure transmitter manufacturer shall be provided. Services shall include a minimum of 1 day on site for each type of pressure transmitter. Services shall include inspection of the installation, initial configuration, startup, testing, adjustments and instruction of the Owner's personnel in operation and maintenance for the pressure transmitters. Instruction and training of the Owner's personnel shall not take place until startup is completed and the pressure transmitters are fully operational and shall be at a time and location agreed to by the Owner. The cost of these services shall be included in the bid price.

The representative shall provide for two additional service calls during the initial 2 years of equipment operation.

*** END OF SECTION ***

SECTION 13426

MAGNETIC FLOW METERS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes furnishing and installing magnetic flow meters as shown on the Plans and as specified herein. The flow meters shall include all necessary accessories and hardware for a complete and workable installation.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01800	Testing, Commissioning, and Training
11000	Equipment General Provisions
Division 16	Electrical

1.3 EQUIPMENT LIST

Equipment numbers are as follows:

<u>Item</u>	<u>Equipment Number</u>
Highland Park Flow Meter	03 FE/FIT 01
Alderbrook Flow Meter	04 FE/FIT 01

1.4 PERFORMANCE REQUIREMENTS

The magnetic flow meters shall have an accuracy of ± 0.8 percent of the actual flow rate at velocities of 1.7 ft/sec or greater.

The flow meters shall be provided with the following size and flow range for the specified application and location.

Flow Meter	Flange Diameter (inches)	Flow Range (gpm)	Transmitter Location
03 FE/FIT 01	6	40-200	Integral
04 FE/FIT 01	6	40-200	Remote

The liquids to be measured will be raw and finished water varying in temperature from 50 degrees F to 100 degrees F.

1.5 DELIVERY, STORAGE AND HANDLING

All equipment shall be completely factory assembled, crated and delivered to protect against damage during shipment.

All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

The magnetic flow meters and transmitter shall be Endress & Hauser Promag W 400. No other manufacturers shall be accepted.

2.2 GENERAL

Electromagnetic flowmeter. Sensor with fixed or lap-joint process connections. EN ISO 12944 corrosion protection for underground or underwater installation. International drinking water approvals. Degree of protection IP68 (Type 6P enclosure). Display with touch control, background lighting. Time-saving local operation without additional software and hardware – integrated web server. Integrated verification – Heartbeat Technology. Transmitter housing made of durable polycarbonate or aluminum. WLAN access. Integrated data logger: measured values monitoring.

The units shall be listed and labeled by an electrical testing laboratory recognized by the Washington State Department of Labor and Industries or be acceptable to the Washington State Department of Labor and Industries for installation on this project.

Each meter system shall be wet-calibrated at the manufacturer's facility against the master system. A calibration certificate shall be furnished for each meter.

Provide grounding rings or grounding electrodes with each flow meter as required to maintain the specified accuracy.

2.3 ANALOG INSTRUMENTATION

The flow meters shall be of the manufacturer's latest design. The equipment shall have 4 to 20 milliamperes standard DC (direct current) isolated floating outputs and shall conform to ISA 50.1. Each output shall be provided with adjustments for gain and bias. Accuracy shall be ± 0.25 percent of full scale output.

Analog instruments shall operate without loss of loop accuracy due to electromagnetic interference, resistive or inductive losses or similar problems related to field interconnection of components when connected with shielded 2/conductor #18 gauge copper wire in the manner shown on the Plans.

PART 3 EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

All equipment shall be completely factory assembled, crated and delivered to protect against damage during shipment.

All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

3.2 INSTALLATION

The flow meters shall be installed as shown on the Plans and in accordance with the Manufacturer's recommendations and instructions. If ground rings are required to maintain the specified accuracy, they shall be installed with the units and bonded to grounding conductor where recommended or required by the Manufacturer.

3.3 FIELD TESTING

The Contractor shall perform the field testing described in Sections 01800 and 11000.

The field test shall insure that the equipment will operate as desired under field conditions. The manufacturer shall provide a formal test procedure and report forms for recording data. The Contractor shall submit the report forms to the Engineer prior to operational testing.

Any defects in the equipment or failure to meet requirements of the Specification shall be promptly corrected by the Contractor.

3.4 MANUFACTURER'S SERVICES

The services of a factory-trained representative of the magnetic flow meter manufacturer shall be provided. Services shall include a minimum of 1 day onsite. Services shall include inspection of the installation, initial configuration, programming, startup, and adjustments and instruction of the Owner's personnel in operation and maintenance. Instruction and training of the Owner's personnel shall not take place until startup is completed and the magnetic flow meters are fully operational and shall be at a time and location agreed to by the Owner. The cost of these services shall be included in the bid price.

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The representative shall provide for two additional service calls during the initial 2 years of equipment operation.

*** END OF SECTION ***

DIVISION 15 MECHANICAL

SECTION 15050

PIPING SYSTEMS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section describes process and utility piping, fittings, supports, and accessories shown on the Plans, described in these Specifications and as required to completely interconnect all equipment with piping for complete and operable systems.

The Contractor shall direct the attention of all subcontractors and suppliers of piping systems and related appurtenances for the work to the applicable provisions in the Contract Documents wherever they may occur.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01800	Testing, Commissioning and Training
02300	Earthwork
09900	Painting
Division 11	Equipment
Division 13	Special Construction
Division 15	Mechanical
Division 16	Electrical

1.3 STANDARDS FOR THE WORK

Pipe, fittings, and supports shall be provided to produce complete, operable systems with all elements properly interconnected as shown in schematic diagrams or to provide specified operations. If a specific dimensioned location is not shown for interconnections or smaller system elements, the Contractor shall select appropriate locations and show them on Shop Drawing submittals for review.

Piping systems and materials shall be new and without imperfections and shall be erected in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the best standard practices for this type of work so that connecting and disconnecting of piping and accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and repair. In order to meet these requirements minor deviation from the Plans may be made as approved by the Engineer.

1.4 PIPE MATERIALS

The materials to be utilized for the various pipe sizes and applications on the project shall be as follows, unless otherwise noted on the Plans or herein:

Process Piping Code (see this sheet	Inside Structures	Buried
$3" < W \le 8"$ $D \ge 4"$	Flanged or grooved ductile iron	Restrained mechanical joint ductile iron or PVC w/ductile iron fittings as noted on the Plans.
W ≤ 2"	Treaded/soldered copper	Welded HDPE

1.5 SUBMITTALS

Submittal data shall be supplied in accordance with Section 01300. Detailed installation drawings of all piping and connected equipment shall be submitted. The drawings shall include all piping, valves, fittings, pipe support locations and types, seismic bracing, and appurtenances.

Submit data to show that the following items conform to the Specification requirements:

- A. Pipe, fittings, and accessories.
- B. Valves.
- C. Couplings and couplers.
- D. Pipe supports and seismic braces as required herein.

Submit certified test reports as required herein and by the referenced standards.

PART 2 PRODUCTS

2.1 GENERAL

Pipe sizes are nominal inside diameter unless otherwise noted.

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

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

All water piping shall be certified under NSF 61 and NSF 372 for potable water use.

2.2 DUCTILE IRON PIPE AND FITTINGS

A. GENERAL

Ductile iron pipe shall be centrifugal cast pipe conforming to AWWA C151, Class 52, unless otherwise noted, cement mortar lined in accordance with, AWWA C104. All flanged spools shall be Class 53 as shall all piping where grooved couplings are used. Approved grooved couplings may be used instead of flanged spools and fittings as approved by Engineer.

All above ground piping shall be flanged or grooved piping unless otherwise specified or indicated.

Below ground piping shall be push on joint or mechanical joints unless otherwise specified or indicated. Mechanical joints shall comply with AWWA C111.

All mechanical joints shall be restrained joints with a retainer. The restrainer shall utilize the full circumference of the pipe for restraining and utilize standard MJ gasket and bolts. The restrainer shall be Grip Ring as manufactured by Romac Industries, Mega-Lug, or equal.

All push on joints shall be restrained with field lock gaskets or TR Flex pipe from US Pipe or equal.

Flanges shall comply with ANSI Bl6.1, Class 125. Flange gaskets shall be full face. Approved adaptor flanges shall be used instead of flanges where shown on the Plans.

Grooved couplings shall be Victaulic Style 31, or engineer approved equal and shall comply with AWWA C606. Victaulic Style 341 adaptor flanges shall be installed instead of flanges where shown on the Plans.

Fittings shall be ductile iron and shall comply with AWWA C110 or AWWA C153, cement mortar lined, 250-psi minimum pressure. Fittings shall be mechanical joint, flanged, or grooved fittings. Fittings with

grooved ends shall comply with AWWA C606 and shall be Victaulic or approved equal. Fittings shall not be "Tyton" or other push-on type joint.

The exterior of buried ductile iron pipe and fittings and pipe and fittings in contact with concrete shall be coated with bituminous coating. The exterior surface of ductile iron pipe and fittings inside of buildings, structures, and vaults shall be painted in accordance with Section 09900 of the Specifications.

All bolts not in contact with potable water shall be coated with Armite Anti-Seize Compound No. 609, or equal, prior to installation. All bolts in contact with potable water shall be coated with an NSF-61 approved antisieze compound, SAF-T-EZE, or equal, prior to installation.

2.3 PVC PIPE AND FITTINGS

A. PRESSURE PIPE

All PVC pipe 3-inch and smaller shall be Schedule 80. Pipe shall be constructed of material that meets or exceeds ASTM D2241 and D1784 and Commercial Standard CS 256. Joints shall be solvent weld with press fit. Fittings shall conform to ASTM D2466 and D2467 for socket type and ASTM D2464 for threaded pipe.

All PVC pipe 4-inch and larger shall be PVC, Cast Iron pipe equivalent O.D., Class 235, conforming to the requirements of AWWA C900. Pipe joints shall be gasketed. Solvent-cement joints will not be acceptable. Fittings for PVC pipe 4-inch and larger shall be ductile iron, as specified in Part 2.2 of this Section.

Provisions for pipe expansion shall be as recommended by the pipe manufacturer.

Bolts for PVC pipe, where required, shall be 316 stainless steel, ASTM A193, Grade B8M, hex head with ASTM A194, Grade 8M hex nuts. Washers of the same material shall be supplied.

2.4 GALVANIZED STEEL PIPE AND FITTINGS

Steel pipe shall be general service, carbon steel pipe conforming to ASTM A53, Grade A, Type E. Pipe shall be Schedule 40 with threaded and coupled fittings. Galvanized pipe and fittings shall be hot-dip galvanized.

Grooved joints may be used in lieu of threaded joints. Where grooved joints are used, they shall be Victaulic or approved equal and shall comply with AWWA C606. Fittings and couplings shall be galvanized in accordance with ASTM A-153.

2.5 COPPER PIPE

Copper pipe and fittings shall be Type K (buried) or Type L or M (above ground), when used as water service lines, and Type L tube, when used as waste, vent or drainage lines.

Grooved joints may be used in lieu of threaded or soldered joints. Where grooved joints are used, they shall be Victaulic Style 607H couplings with Copper-Connection fittings, or approved equal. Grooved joints for copper tubing shall be manufactured to copper-tube dimensions. Flaring of tube or fitting ends to accommodate alternate size couplings is not permitted.

2.6 MISCELLANEOUS FITTINGS

A. FLEXIBLE COUPLINGS

Flexible couplings shall be Romac 501 or approved equal. Middle ring and follower shall have fusion bonded epoxy coating. All buried flexible couplings shall be furnished with stainless steel bolts and nuts.

Harness lugs and tie bolts for harnessed joints on steel pipe shall comply with AWWA M-11, Third Edition and as shown on the Plans. All buried harnessed joints shall be furnished with stainless steel tie bolts and nuts.

B. FLANGED COUPLING ADAPTERS

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

C. ADAPTER FLANGES

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

D. FLEXIBLE EXPANSION PIPE JOINT

The flexible expansion pipe joint shall be installed at the location(s) indicated on the Plans and shall be manufactured of ductile iron conforming to the material properties of AWWA C153. The flexible expansion joint shall consist of an expansion joint designed and cast as integral part of a ball and socket type flexible joint, and provisions for contraction/expansion and self restrained at full expansion. The units shall be force balanced to provide flexibility while minimizing elongation due to line pressure.

Furnish two 6-inch and two 8-inch mechanical joint double-ball expansion joints providing 6-inch minimum expansion and 15 degrees deflection. The flexible expansion joint shall be hydrostatically tested to the manufacturer's published pressure rating prior to shipment. All pressure containing parts shall be lined with a minimum of 15 mils of Fusion Bonded Epoxy conforming to the applicable requirements of AWWA C213 and shall be holiday tested with a1,500 volt spark test conforming to said specifications.

The flexible expansion pipe joints shall be force balanced "Flex-Tend" as manufactured by EBAA Iron, Inc., or equal.

Polyethylene sleeves meeting ANSI/AWWA C105/A21.5 shall be included.

E. GROOVED PIPE COUPLERS

Grooved pipe couplers for steel pipe shall consist of two ductile iron housing segments conforming to ASTM A536, pressure responsive elastomer gasket, and ASTM A449 zinc electroplated steel bolts and nuts. Couplings shall comply with ASTM F1476 "Standard Specification for the Performance of Fittings for Use with Gasketed Mechanical Couplings Used in Piping Applications."

1. Rigid Type

Housings shall be cast with offsetting angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.

a. 2 Inch through 8 Inch

Installation-Ready, for direct stab installation without field disassembly, with grade EHP gasket rated to +250 degrees

F/120 degrees C. Couplings shall be Victaulic Style 107, or approved equal.

b. Couplings shall be Victaulic Zero-Flex Style 07.

2. Flexible Type

For use in locations where vibration attenuation and stress relief are required. The couplings shall be placed in close proximity to the source of the vibration. Couplings shall be Victaulic Style 77, or approved equal.

Grooved pipe couplers for ductile iron pipe shall be Victaulic Style 31, or approved equal.

The gaskets shall be suitable for use in potable water.

All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

F. DIELECTRIC INSULATED UNIONS

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

G. WALL SLEEVES AND SEALS

Wall and/or floor pipe penetrations shall be made by means of a sleeve capable of being bolted directly to the formwork to prevent misalignment. Seal of the annular space between the carrier pipe and the sleeve shall be by means of a confined rubber gasket and capable of withstanding 350 psi. Sleeve shall be manufactured from Ductile Iron with an integrally cast waterstop of 1/2-inch minimum thickness and 2-1/2-inch minimum height. Wall sleeves shall be omni*sleeve, or equal.

Seals for pipe sleeves shall be bolt-up type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the sleeve. When bolts are tightened the rubber sealing elements shall expand to result in a watertight seal. Bolts and pressure plate nuts shall be Type 316 stainless steel in below grade or

"wet" locations, and of carbon steel at other installations. Rubber links shall be suitable for use in water, moist environments, normal atmospheric conditions, and -40 degrees F to 250 degrees F temperatures for standard service.

2.7 PIPING INSULATION

All new above ground exterior pipe carrying liquids, shall be insulated with 1-inch-thick fiberglass insulation and 0.016-inch anodized aluminum jacket; insulated by Owens-Corning, Certainteed, Johns-Manville or equal, unless otherwise noted. Buried piping carrying liquids with less than 36 inches of cover shall be insulated with Rubitex closed cell foam insulation, or equal.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. GENERAL HANDLING AND PLACING

All piping constructed on this project shall be performed in accordance with the Uniform Plumbing Code. These Plans do not detail all items such as complete venting, etc.; however, it is understood that this work shall be included as a part of this Section and all costs included in the lump sum bid.

Pipe and accessories shall be handled in such a manner as to insure delivery on site in sound, undamaged condition. Particular care taken not to injure pipe coating. No other pipe or material of any kind shall be placed inside of lined pipe or fitting after lining has been applied. All pipe and fittings shall be unloaded, stored, handled in such a manner as to insure against damage. Dropping of pipe or fittings shall be cause for rejection.

The types and sizes of pipes to be used shall be as specified herein and as shown on the Plans. Where sizes of small pipe are omitted from the plans and not mentioned in the Specifications, the sizes to be used shall correspond to plumbing code requirements. In any event, undesignated pipe sizes shall be proper for the function to be performed and as accepted by the Engineer.

All pipe shall be carefully placed and supported at the proper lines and grades and where possible shall be sloped to permit complete drainage. Piping runs shown on the Plans shall be followed as closely as possible, except for minor adjustments to avoid architectural and structural features. If major relocations are required, they shall be approved by the Engineer.

Unions shall be installed in all threaded joint piping to facilitate the removal of sections for maintenance and repair in accordance with the best trade practice. Unions shall be ground joint, malleable iron type. Where unions connect dissimilar materials, the union shall be protected from reaction with dissimilar metals by installation of insulating materials and dielectric unions at contact points.

The interior of all piping shall be cleaned after assembly and before connecting to equipment.

All piping for which no location dimensions are shown shall be installed in a neat and workmanlike manner in accordance with best trade practice. Wherever possible runs and rises shall be grouped and kept parallel. Properly lay out all miscellaneous piping to clear obstructions such as passageways, equipment, larger sized pipes, ventilation ducts, lights, etc.

Whenever pipe requires field cutting to fit in line, work shall be done by a machine in a satisfactory manner so as to leave a smooth end at right angles to axis of pipe.

All piping to be buried below structures, foundations, or slabs shall be installed with extreme care. When all joints have been made, Contractor shall demonstrate to Engineer's satisfaction that all of piping is watertight and that all lines are clear before proceeding with any work above this piping. It shall be Contractor's responsibility to see that these lines are kept clear until final acceptance of the project, providing suitable tight wooden bulkheads or plugs for open end pipes. Any blockage of these systems due to earth, debris, cement slurry or anything else shall be rectified at Contractor's expense before project is accepted.

All pipe shall be installed in strict accordance with manufacturer's recommendations and/or specifications, and best commercial trade practice. Any special tools required for laying, jointing, cutting, etc., shall be supplied and properly used. All pipe shall be kept thoroughly clean until acceptance of completed work, and shall conform accurately to lines and grades given. At all times during pipe laying operations keep trench free of water either by pumping, bailing, or drainage. Seal end of line with a tight-fitting plug when pipe is not being laid.

Valves shall have interiors cleaned of all foreign matter and inspected, both in open and closed positions prior to installation.

All pipes running through concrete walls below water surface or where subject to groundwater pressure shall be assembled as shown on the plans.

Pipes running through concrete not subject to water pressure may be installed through standard steel sleeves, one or two pipe sizes larger than pipe in question. The pipe shall be free of all dirt and grease and thoroughly cleaned to insure a tight bond with the concrete.

All above ground outside pipe carrying liquids shall be insulated.

All buried, submerged, or intermittently submerged piping that is bolted together or uses bolts to hold materials together shall use 316 stainless steel nuts, bolts, and washers. This requirement applies to a distance of 12 inches above the highest water level in any tank, channel, or structure. Otherwise, bolts, nuts, and washers may be hot-dip galvanized steel.

B. GENERAL EXPOSED PIPING INSTALLATION

Unless shown otherwise, piping shall be installed parallel to building lines, plumb, and level.

Piping shall be installed without springing or forcing.

All pipe flanges shall be set level, plumb, and aligned. All flanged fittings shall be true and perpendicular to the axis of the pipe. All bolt holes in flanges shall straddle vertical centerline of pipes.

Flexible couplings shall be provided for all piping connections to motordriven equipment and where otherwise shown in the Plans. The Contractor may install additional flexible couplings at approved location to facilitate piping installation, provided that he submits complete details describing location, pipe supports, and hydraulic thrust protection.

Unions or flexible couplings shall be installed where shown on the Plans, and at all non-motor-driven equipment to facilitate removal of the equipment.

Where equipment drain connections are provided, they shall be valved, with the discharge pipe carried to the nearest floor drain, drain trench, or sump. Where no receptacle for drain exists, drain valves shall be piped to 1 inch above the floor. Drain piping and valve materials shall conform to the requirements of the system served.

All exposed or submerged piping shall be painted and color-coded in accordance with Section 09900, unless otherwise specified.

3.2 PVC PIPING

A. GENERAL

PVC piping socket weld connections shall be made up in accordance with the pipe manufacturer's recommendations and as follows:

Where pipe is cut, remove all burrs and ream inside to provide smooth flow line. Bevel the plain end pipe 1/16 inch to 1/32 inch. Joints shall be first cleaned with cleaner before making up. Apply primer to the female joint. Apply primer to the male joint. Reapply primer to the female joint. Apply glue to the male joint. Apply glue to the female joint. Reapply glue to the male joint. Join pipe quickly with a 1/4 turn. If joint cannot be made up to full depth of socket, cut out and discard. Wipe off excessive cement. Hold for 30 seconds and do not move for 15 minutes after making up joint. Pipe joining below 40 degrees F will not be permitted. Cleaner and cement types shall be as recommended by the manufacturer for the size of pipe being used.

3.3 FLANGED PIPING

Flanged joints shall be made in accordance with best trade practice. Screwed flanges for piping shall be run until pipe projects beyond face and no more than one thread is exposed on backside. All flange faces shall then be machined so as to be perfectly parallel. All flanged pipe shall be accurately dimensioned; no "drawing-up" will be allowed. Gaskets shall be full face, rubber.

3.4 GROOVED JOINT PIPING

Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for Contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review Contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s)).

3.5 THREADED PIPING

Threads for threaded joint piping shall be neatly cut with sharp tools and jointing procedure shall conform to best practice. Before jointing, all scale shall be

removed from pipe by some suitable means such as pounding. After cutting, all pipe shall be reamed. All pipe shall be screwed together with an application of approved pipe compound applied to all male threads. Once a joint has been tightened, it shall not be backed off unless threads are recleaned and new compound applied. This application neatly made; all compound, dirt thoroughly wiped off outside of every joint.

Unions shall be installed in all threaded joint piping to facilitate removal of sections for maintenance, repair in accordance with best trade practice. All such unions shall be included in bid price whether shown on Plans or not.

3.6 MECHANICAL JOINT PIPING

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

3.7 COPPER PIPE

All copper water service lines shall be tested, cleaned, and chlorinated, as described below. All waste, vent or drainage lines shall be flushed clean, and shall be tested by plugging the lowest point and filling the waste, vent or drainage piping with water to the level of the top of the vent pipe, but no joint in the system shall be submitted to a test of less than 10 feet of head. Under this condition, all joints shall remain watertight for a period of not less than 1 hour.

Piping shall be pressure-tested with water to a pressure of 125 psi.

3.8 PIPE SUPPORTS

Provide all necessary supports, tie rods, bracing, brackets or other types of supports which may be required, as shown on the Plans, or as specified in Section 15066.

3.9 FLEXIBLE COUPLINGS

Flexible couplings shall be installed in accordance with recommendations of manufacturer and used where indicated on the Plans. Finished joint shall be airtight or watertight under test pressure of pipeline. Buried flexible couplings shall be coated with asphalt base paint after assembly.

3.10 PIPE BEDDING

All pipe shall be bedded as specified in Section 02300.

3.11 TESTING

A. GENERAL

All piping shall be tested and inspected in accordance with the provisions of Division 7 APWA/WSDOT, except as modified herein. Where new piping systems are being connected to existing piping systems the existing piping systems shall be tested prior to connecting to the new pipe to the existing piping. Once the new piping system has been connected to the existing piping system the entire system shall be tested again.

All piping systems will be tested to demonstrate leak tightness prior to acceptance. The Contractor shall provide all equipment and labor necessary to perform all testing required herein, the costs to be included in the lump sum bid price.

Each particular piping system shall be tested as hereinafter specified. All leaks shall be repaired or defective material replaced and the test repeated as directed by the Engineer. After compliance with test requirements and approval of the Engineer, the field painting, where required, may be started. All pressure testing shall be done prior to any finish painting or pipe insulating.

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

All thrust blocks shall be in place for at least 7 days to allow concrete to cure before testing. Install adequate blocking or other means of resisting test pressure.

B. DISINFECTION

Before being placed into service, all new and modified potable water pipe and appurtenances shall be sterilized and a satisfactory bacteriological report obtained in accordance with Section 02510.

*** END OF SECTION ***

SECTION 15066

PIPE AND CONDUIT SUPPORT SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The work specified in this Section includes pipe and conduit hangers, brackets, and supports. Pipe and conduit support systems shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers, structural attachments, and other accessories as shown on the Plans and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01600	Materials and Equipment
01800	Testing, Commissioning, and Training
09900	Painting
15050	Piping Systems
15400	Plumbing
16050	Basic Electrical Materials and Methods
16130	Raceways and Boxes

1.3 REFERENCES

All pipe and conduit support materials and methods shall conform to the latest, applicable requirements of documents listed hereafter. In case of conflict between this section and the listed documents, the requirements of this Section shall prevail.

ANSI A13.1	Piping and Piping System
ANSI B31.1	Power Piping
ASME	Boiler and Pressure Vessel Code
ANSI/MSS SP-58	Pipe Hangers and Supports C Materials, Design and
	Manufacture
ANSI/MSS SP-69	Pipe Hangers and Supports C Selection and
	Application
SMACNA	Seismic Restraint Manual C Guidelines for
	Mechanical Systems
IPC	International Plumbing Code

1.4 SUBMITTALS

In accordance with the requirements of Section 01300, submit the following project data prepared by a licensed Professional Engineer:

- A. Manufacturer's technical data for all hangers, brackets, supports and documentation of conformance with appropriate standards and these specifications.
- B. Location of pipe and conduit support, including type of structural and pipe attachments, shown on detail drawings and/or specified under paragraph 1.5 of Section 15050.

PART 2 PRODUCTS

2.1 GENERAL

The Contractor shall design, provide, and install pipe and conduit support systems, which include hangers, brackets, supports, anchors, expansion joints, and structural attachments. The support system shall be pipe rack, trapeze pipe hangers or individual pipe clamps, hangers, supports and structural attachments as specified herein. The support system shall be designed in conjunction with the pipe and conduit to be supported. Seismic restraints shall be provided in accordance with SMACNA Manual as referenced in paragraph 1.3.

In certain locations, pipe supports, anchors, and expansion joints have been indicated on the Plans, but no attempt has been made to indicate every pipe support, anchor, and expansion joint. It shall be the Contractor's responsibility to provide a complete system of pipe and conduit supports. Pipe support schedule under paragraph 2.7 of this Section sets forth minimum requirements for pipe supports.

2.2 PIPE RACKS AND TRAPEZE HANGERS

Pipe and conduit racks and trapeze hangers shall be constructed of galvanized steel channels, rods, posts, post base, clamps, brackets, fittings, and accessories for supporting pipes in equipment and pump rooms. All components for pipe and conduit rack and trapeze shall be Unistrut or equal.

2.3 PIPE CLAMPS AND HANGERS

In areas where pipe racks and trapezes are not used, pipe shall be supported with clamp hangers and stanchion saddle support system. The clamps and hangers shall be fastened to threaded rods hanging from structural attachments. Pipe supports shall be selected for the size and type of pipe to which they are applied.

Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item.

All pipe clamps and hangers, including all accessories, shall be galvanized steel for indoor use and Type 316 stainless steel for outdoor use.

Pipe and conduit clamps and hangers shall be as manufactured by Anvil or equal and shall be as follows:

	Pipe Size	Pipe	Anvil
Type	(In.)	Material	Figure
Swivel Ring, Split Type	3/4 to 8	All type	104
Split Clamp	1/2 to 3	All type	138R
Adjustable Ring	1/2 to 6	All type	97
Adjustable Ring	1/2 to 4	Copper	CT-269
Adjustable Clevis	3 to 24	All type	590
Pipe Clamp	3 to 42	All type	216
Socket Clamp	4 to 24	Cast Iron	595
Pipe Stanchion	4 to 24	All Type	63
Stanchion Saddle	4 to 36	All type	259
Adjustable Saddle Support	3 to 36	All type	264
Riser Clamp	2 to 24	All type	40
Adjustable Pipe Roll	6 to 12	Stainless Steel	177, 181, or 274

2.4 STRUCTURAL ATTACHMENTS

Structural attachments shall be concrete insert channels or individual inserts for new concrete, surface-mounted channel or individual inserts for existing concrete or where applicable, steel, roof plate supported attachments in the control building, complete with all accessories required. All structural attachments including all accessories shall be galvanized steel for indoor use and stainless steel for outdoor use, and shall be provided by a single manufacturer. Structural attachments shall be as measured by Unistrut Corporation or approved equal.

2.5 PIPE SUPPORT ATTACHMENTS TO CONCRETE

All pipe support attachment to concrete shall be in adhesive anchors unless noted otherwise.

Products which may be incorporated in the work include, but are not limited to, the following:

- A. HIT RE 500 Injection Adhesive Anchor, Hilti, Inc.
- B. HIT HY 150 Injection adhesive Anchor, Hilti, Inc.
- C. Power-Fast, Powers Fasteners, Inc.

2.6 PROTECTION SADDLES

Protection saddles shall be used for protecting pipe insulation against damage at pipe supports or as shown on the Plans. The nominal thickness of covering shall be the same as that of pipe insulation. The protection saddles shall be curved carbon steel plate and shall be Anvil Figure 160 through Figure 166 or approved equal.

2.7 SPACING

Maximum support spacing shall conform to the following table:

Pipe Size Inches	Pipe Material	Maximum Spacing Feet
	Iron or Steel	6
1" & Smaller	Copper	4-1/2
	Plastic	continuous
	Tubing	continuous
1-1/4 to 2"	Iron or Steel	8
	Copper or Plastic	5
2-1/2 to 4"	Iron or Steel	10
	Copper or Plastic	6
6 to 9"	Iron or Steel	12
6 to 8"	Plastic	8

PART 3 EXECUTION

3.1 DESIGN

Pipe and conduit support systems shall be designed in accordance with applicable reference standards specified in paragraph 1.3. Pipe and conduit supports shall be designed and selected to withstand seismic loads for IBC 2015 Seismic Design Category D with Ss=1.5 and S1=0.599g and shall adhere to the following conditions:

A. Weight balance calculations shall be made to determine the required supporting force at each pipe support location and the pipe weight at each equipment location. Design loads for inserts, clamps, and other support items shall not exceed the manufacturer's recommended loads.

- B. Pipe supports shall be able to support the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment. Allow clearances for pipe expansion and contraction.
- C. Wherever possible, pipe attachments for horizontal piping shall be pipe clamps, or as shown on the pipe support detail sheet. Horizontal or vertical pipes should be supported preferably at locations of least vertical movement.
- D. All pipe supports shall provide a means or vertical adjustment after erection.
- E. Where practical, riser pipe shall be supported independently of the connected horizontal piping. Pipe support attachments to the riser piping shall be riser clamps.

3.2 INSTALLATION

Pipe support system shall be installed strictly in accordance with standards and codes referenced in paragraph 1.3 of this Section and piping support system manufacturer and piping manufacturer's recommendations.

In addition, all piping shall be rigidly support and anchored so that there is no movement or visible sagging between supports.

Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Supports for brass or copper pipe or tubing shall be copper-plated. Those portions of pipe supports, which contact other dissimilar metals, shall be rubber or vinyl coated.

Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead-ending. Anchors shall be located as required to force expansion and contract movement to occur at expansion joints, loops, or elbows, and as required to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints. Anchorage for bellows type expansion joints may be located adjacent to the joint.

Pipe supports and expansion joints are not required in buried piping, but concrete thrust blocking or other approved anchorage shall be provided as indicated on the Plans or specified in other sections.

***END OF SECTION ***

SECTION 15100

VALVES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section shall consist of valves and accessories as shown on the Plans, described in these Specifications, and as required to completely interconnect all equipment with piping for complete operable systems.

1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Payment
01300	Submittals
01800	Testing, Commissioning and Training
Division 11	Equipment
Division 15	Mechanical

1.3 SUBMITTALS

Submit Catalog cuts and shop drawings in accordance with Section 01300 to demonstrate that the valves and appurtenances conform to the Specifications requirements.

The Contractor shall furnish manufacturer's installation and operation manuals, bulletins, and spare parts lists for all valves.

1.4 QUALITY ASSURANCE

All materials and equipment furnished under this Section shall be by the manufacturer specified.

All materials in contact with potable water shall be NSF 61 and NSF 372 certified for potable water use.

See Section 15400 for Plumbing specifications and requirements.

PART 2 PRODUCTS

2.1 GATE VALVES

Gate valves 3 inches and smaller shall be bronze, non-rising stem, wedge disc, 125 pound service, Crane No. 438, Kennedy Figure 427, or equal.

Mason County PUD No. 1
Manzanita Reservoir and Booster Pump Station
G&O #22260 15100-1 - Valves

Gate valves larger than 3 inches shall be iron body, bronze mounted, resilient seat, wedge disc, left opening, high-strength bronze stem, O-ring with a 2-inch-square operating nut and complying with AWWA C509 or C515. Gate valves shall be non-rising stem unless noted otherwise.

Above ground gate valves shall be provided with handwheels.

2.2 BUTTERFLY VALVES

Butterfly valves for air service shall be iron body and disc, Viton resilient seat, stainless steel shaft, bronze bearings, lug body style, suitable for service in air to 350 degrees F. Air service butterfly valves shall be DeZurick, Pratt, or equal.

Butterfly valves for liquid service shall have iron body and disc, Buna N seats attached to the valve body, stainless steel shaft, corrosion resistant bearings, and flanged style body and shall comply with AWWA C504. Extension bonnets shall be sealed from liquid intrusion and shall encase the valve torque tube from the valve trunnion to the top-mounted geared handwheel actuator. The entire assembly shall be factory assembled and tested. Liquid service butterfly valves shall be DeZurik, Pratt 2FII, or equal.

Where butterfly valves are installed adjacent to check valves or other fittings, which interfere with the valve's full range operation, flange fillers, or other spacers, shall be installed between the valve and the obstructing fitting as necessary to insure unrestricted operation of the butterfly valve from full open to closed.

2.3 CHECK VALVES

In line rubber check valve shall be slip-in Tideflex Checkmate, or approved equal. The materials in contact with domestic water shall be NSF approved.

2.4 COMBINATION AIR AND VACUUM VALVES

Air release valves on potable and non-potable water pipes shall be APCO Models 50 or 55, or equal. Each air valve shall be provided with an isolation valve for isolation on the inlet side. A vent pipe shall be routed from the valve to within 12 inches of the floor, unless otherwise noted on the Plans. Orifice shall be sized for maximum system pressure. Valve body shall have a minimum pressure rating of 150 psi. Pins, levers, retaining rings, float ball and internal screws shall be stainless steel.

2.5 BRASS BALL VALVES

Brass ball valves shall be full port, with two piece body, rated for 150 psi. Valves shall be lead free brass and shall be NSF 61 and NSF 372 approved for potable water use. Valves shall conform to MSS-SP-110.

2.6 DUCKBILL CHECK VALVES

Duckbill check valves shall be as manufactured by Tideflex, Red Valve Co., or equal. The materials in contact with domestic water shall be NSF approved.

2.7 VALVE IDENTIFICATION TAGS

Each shut-off or control valve, shall be provided with a 1-1/2-inch minimum diameter heavy brass tag. Tags shall bear the identifying number of the valve and one or more identifying letter symbols of the service line.

Numbers and letters shall be block type with 1/2-inch-high numbers and 1/4-inch-high letters stamped on the tags and filled with black enamel.

Attach tags to the valves by split-key rings soldered so that the ring and tag cannot be removed.

Furnish a drawing and a neatly typed valve directory listing each valve number, type of valve and its location. Submit the directory and drawing to the Owner for approval.

2.8 VALVE BOXES

There shall be furnished and installed with all valves installed underground, two piece adjustable cast iron valve boxes with a minimum inside diameter of 5 inches. The valve boxes shall be set concentric with the axis of the stem and adjusted to the finish grade. Valve box lids shall be identified with a letter/number code and opening direction designation as shown on the Plans.

2.9 VALVE INSULATION

All new above ground valves carrying liquids shall be insulated with 1-inch-thick fiberglass insulation and 0.16 of an inch anodized aluminum jacket; insulation by Owens-Corning, Certainteed, Johns-Manville or equal, unless otherwise noted.

PART 3 EXECUTION

3.1 GENERAL

All valves and accessories shall be installed in a manner and location as shown on the Plans or as required for the application and in accordance with manufacturer's instructions. Valve size is fully equal to line piping in which the valve is installed unless otherwise noted on the Plans. Support all valves where necessary. In case on conflict between these Specifications and a governing code, the more stringent standard shall prevail.

All valves of the same style or type shall be furnished by a single manufacturer.

Provide all accessories necessary for proper valve operation as specified or required for the application. Buried valves shall be installed with square operating nuts and adjustable cast iron valve boxes with covers. Valve boxes shall be set such that the slots in the boxes are in line with the run of pipe the valves are in. Provide two sets of T wrenches for buried valve operation.

Buried valves shall be provided with 1-inch solid steel extension stems with rock guards if the operating nut will be 18 inches or more below the ground surface.

Valves shall be installed with the operator in a position for convenient operation. Particular care shall be taken to insure that space is available for operation of lever or handwheel operated valves without interference to walls, piping or equipment. Any valve which is installed, in the opinion of the Engineer, in a manner that operation is inconvenient shall be modified or removed and reinstalled in a manner suitable to the Engineer at the expense of the Contractor. Operations for manual valves shall be lever or handwheel as is standard with the manufacturer unless another type of operator is specified or required by the manufacturer.

For submerged valves, provide stem guides as recommended by the valve manufacturer on a spacing of 6'-0". As an alternate, provide valves with extended bonnets where practical. Provide supports for extended bonnets as required. Stem guides and supports shall be 316 stainless steel. All installation fasteners for submerged valves, guides, and supports (nuts, bolts and washers) shall be 316 stainless steel.

*** END OF SECTION ***

SECTION 15700

HEATING, VENTILATION, AND AIR CONDITIONING

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section shall consist of the heating, ventilation, and air conditioning equipment and other associated items as shown on the Plans, and as further specified herein.

All permits shall be obtained in accordance with Section 01160.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>Item</u>
01160	Regulatory Requirements
01300	Submittals
Division 16	Electrical

1.3 QUALITY ASSURANCE

Submittals shall be in accordance with Section 01300.

All equipment supplied in this Section shall be provided to produce complete, operable systems with all elements properly interconnected as shown in schematic diagrams or to provide specified operations. If a specific dimensioned location is not shown for interconnections or smaller system elements, the Contractor shall select appropriate locations and show them on shop drawing submittal for review.

Equipment and material shall be new and without imperfections and shall be erected in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the recommendations of the manufacturers and the best standard practices for this type of work to ensure connecting and disconnecting accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and repair. Oil and lubrication fittings shall be located clear of and away from guards, base, and equipment and within reach from the operating floor whenever possible. In order to meet these requirements with equipment as furnished, minor deviation from the Plans may be made as approved by the Owner.

15700-1

The manufacturer's recommendations and instructions of products used in the work are hereby made part of these Specifications, except as they may be superseded by other requirements of these Specifications.

1.4 EQUIPMENT LIST

Refer to Heating, Ventilation and Air Conditioning Schedules shown on the Plans.

1.5 SUBMITTALS

Submit manufacturer product data on HVAC equipment, as listed in this Section, under the provisions of Section 01300.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

Equipment manufacturers and model numbers shall be as shown on the Plans except where indicated herein.

2.2 LOUVERS

Louver performance data shall be licensed under the AMCA Certified Ratings Program and shall bear the AMCA Certified Ratings Seal. Certified performance data shall include airflow pressure loss and water penetration.

Louvers shall be stationary type with drainable blades in a 6-inch louver frame. Each stationary blade shall incorporate an integral drain gutter and each jamb shall incorporate an integral downspout so water drains to blade end, then down the downspouts and out at the louver sill. The louver construction shall consist of a frame and blades from aluminum extrusions of minimum 0.081-inch nominal wall thickness. The blades shall be positioned at 37 degree angles. Each louver shall be equipped with a framed, removable, 0.125 x 3/4 flattened aluminum rearmounted bird screen or 16 x 18 mesh aluminum insect screen. Louvers shall be supplied with a Kynar finish which meets AAMA 2605. Each factory-assembled louver section shall be designed to withstand wind loadings of 25 psf. Drainable blade louvers shall be Greenheck ESD series, or equal.

2.3 GRAVITY BACKDRAFT DAMPERS

Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D.

Gravity backdraft dampers shall be suitable for pressures up to 1-inch w.g., velocities to 2,500 ft/min and temperatures to 180 degrees F. Gravity-operated back draft dampers shall rotate to the fully open position in the direction of the airflow when subjected to a differential pressure of 0.2 of an inch w.g. or less. Gravity damper construction shall consist of minimum 18-gauge galvanized steel frame with 2.5-inch to 3.5-inch depth; aluminum blades; 304 stainless steel axles turning in acetal bearings. The damper shall be equipped with extruded vinyl blade seals; and internal aluminum tie bar with spring assist. Finish shall be as shown on equipment schedule. Gravity backdraft dampers shall be Greenheck WD series, or equal.

2.4 ROOF EXHAUST FANS

Fans shall be bear the AMCA Certified Ratings Seal for both sound and air performance and be UL tested and approved.

Roof mounted exhaust fans shall be of down-blast type. The fan, fan housing, and accessories described below shall be one unit supplied by the same manufacturer. Hood construction shall be of heavy extruded aluminum. Fan wheel shall be of backward inclined centrifugal type and be constructed of aluminum. Fan wheel shall be statically and dynamically balanced. Motor shall be a DC electronic commutation type motor specifically designed for fan applications. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor shall be included. Speed shall be controllable down to 20% of full speed and shall be controlled by either a potentiometer dial mounted on the motor or by a 0-10 VDC signal. Motor shall be permanently lubricated, heavy duty ball bearing type. The fan shall be complete with bird screen, vibration isolators, and gravity back-draft damper designed with edge seals. Roof exhaust fans shall be Greenheck G series, or equal.

2.5 ELECTRIC UNIT HEATERS

Heaters shall be UL Listed, CSA Certified and meet requirements of the National Electrical Code.

Heaters shall be horizontal or vertical mount type. Heater housing shall be constructed of heavy gauge steel. Heaters shall be fan-forced air unit with aluminum finned, copper clad heating elements. The fan shall be completely enclosed and dynamically balanced. The unit shall be complete with pivotal wall or ceiling mounting kit as specified on Plans, control transformer, automatic reset thermal overheat protector, adjustable louvered outlet grille and enamel finished steel housing; all shall be one unit supplied by the same manufacturer. Unit heaters shall be Qmark MUH series, or equal.

2.6 THERMOSTATS

Provide thermostats, as required to control heating and ventilating equipment. Thermostats shall be located on an interior wall that does not receive direct solar exposure unless otherwise indicated.

Modulating thermostats shall regulate fan speed based on level of temperature space. Control shall include a Proportional Integral Derivative (PID) feedback loop and shall have labeled terminal strips. Control shall output a 0-10 VDC signal to operate an electronic commutation (EC) motor. Temperature setpoint range shall be 50-90 °F. Modulating thermostats shall be Greenheck Temperature/Humidity Control, or equal. Contractor shall provide power wire and appropriate conduit installation for all powered thermostats.

2.7 TAPE

Non-combustible, three inches in size, foil backing, pressure-sensitive lap of facing material. NASHUA 322, NASHUA FSK (High Pressure) or equal.

2.8 METAL DUCTWORK

Metal ductwork for air supply and return air shall be fabricated in accordance with ASTM A527 (galvanized sheet metal) or ASTM A167, ANSI Type 302/304 (stainless steel sheets) if S.S. ductwork is shown on the Plans. Metal ductwork shall be rigidly constructed and installed. Slip joints shall be in the direction of air flow. All joints shall be sealed tight. Bonding materials for sealing duct system and attaching insulation shall be supplied by manufacture. Ducting shall be United McGill, SMACNA or equal.

Hangers shall be secured to the ceiling or walls and shall be adequate to support ductwork. Where ducts go through walls, there shall be 1/4-inch clearance left and this area shall be sealed tight with compatible mastic and foam rubber and the penetration area covered over with flanges that are secured to the ductwork only. Volume dampers shall be located as shown on the Plans, and at a minimum of one damper for each branch duct installed. Dampers are to be of the same material as the ducts they are installed in. Fire dampers shall be installed in ductwork as directed by the Building Permit or required by the Owner.

Ductwork shall be installed and supported to comply with the requirements and recommendations of Sheet Metal and Air Conditioning Contractors National Association (SMCACNA) HVAC Duct Construction Standards. Sheet metal plenum shall be constructed of not lighter than 18-gauge galvanized steel and reinforced with 1-1/2-inch by 1-1/2-inch by 1/8-inch angles as required to prevent drumming or breathing. Access openings and covers shall be provided for

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cleaning, wiring and servicing motors, filters, fans and dampers located within or blocked by sheet metal work.

2.9 DUCT HANGERS AND SUPPORTS

Comply with requirements and recommendations of Sheetmetal and Air Conditioning Contractors National Association (SMACNA) HVAC Duct Construction Standards.

Conform to requirements of SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems."

Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

Hanger straps and rods shall be in accord with SMACNA Duct Construction Standards.

Fasten bracing to ductwork, including riveting, bolting, and tack welding per SMACNA.

Provide galvanized steel band or fabricated angle iron brackets for wall supports, except in wet well area where stainless steel components are required.

A. HANGER RODS

Carbon Steel, with hex nuts and flat washers.

B. CONCRETE INSERTS

- 1. Continuous channel Unistrut.
- 2. Universal, malleable iron Type 18, FS WW-H-171.

Beam Clamps and Attachments as required.

2.10 SEISMIC SUPPORTS

All HVAC supports, tie rods, bracing, brackets or other types of supports shall be designed in accordance with the current edition of the International Building Code (IBC) and ASCE 7-10. Evaluate the seismic loads in accordance with IBC and Chapter 13 of ASCE 7-10 for the seismic design parameters shown on the Plans.

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PART 3 EXECUTION

3.1 INSTALLATION

All materials shall be installed as shown on the Plans and according to manufacturer's recommendations. Adjust all dampers and louvers to provide tight seal when closed and unobstructed flow when open. Provide all necessary controls, and coordinate all control wiring with Division 16. All installed equipment shall function in manner intended.

The heating/cooling system shall be installed as shown on the Plans and shall be connected to any ductwork with flexible connections. The Contractor shall be responsible for the installation of any condensate drain piping and conduit/wire runs for controllers/thermostats.

3.2 TESTING, ADJUSTING AND BALANCING

Α. **QUALIFICATIONS**

All work shall be performed under the direct supervision of an AABC Certified Test and Balance Engineer. Resumes including education, experience, and certification of each person on the project shall be submitted for review and approval by the Owner. Notify the Owner 10 days prior to testing. The Owner shall witness the testing and balancing.

B. INSTRUMENTATION

All instruments used will be currently calibrated and listed in the TAB report showing instrument description, serial number, and date of calibration.

C. AIR BALANCE

When systems are complete and ready for operation, the TAB Agency will perform a final air balance for all air systems and record the results. The volume of air for the supply, return, exhaust, and outside air equipment and terminals will be tested and balanced within the tolerances of the AABC Standard. The general scope of balancing by the TAB Agency will include, but is not limited to, the following:

1. Fan Speed

Measure and record RPM at each fan speed.

2. Voltage and Amperage Readings

Measure and record the final operating amperages and voltage for each motor.

3. Static Pressure Profile

Static pressure profiles shall be measured and recorded across each supply fan, cooling coil, heating coil, return air fan, air handling unit filter, and exhaust fan, and at the furthest air device or terminal unit from the air handler supplying that device. Static pressure profiles shall also be provided for systems, which do not perform as designed.

4. Equipment Air Flow

Adjust and record exhaust, return, outside, and supply air CFM and temperatures, as applicable, at each fan.

D. REPORTS

The report will contain all required information as described within this specification, including the information formatted and shown in the AABC Standard. Include with the data the date tested, personnel present, records of test instruments used, and a list of all measurements taken. All measurements and recorded readings (of air, water, electricity, etc.) that appear in the reports shall be certified by the Agency's Test and Balance Engineer. Six copies of the final report shall be submitted to the Owner indicating a summary of actual operating data and any abnormal operating conditions.

E. EXECUTION

- 1. Provide additional dampers, and clean filters as specified herein and shown on the Plans.
- 2. Put all system and equipment into operation and continue operation until all adjusting, balancing, testing, demonstrations, instructions, and cleaning of systems have been completed.
- 3. Do not begin testing and balancing until systems are completed and in good working order.

- 4. Check motors for proper rotation, coupling and drive alignment, belt tension, and freedom from vibration, etc.
- 5. Make all changes to drives and dampers as necessary to accomplish specified airflows.

END OF SECTION

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DIVISION 16 ELECTRICAL

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the requirements and methods for furnishing and installing the basic electrical materials, and other associated items as shown on the Plans, and as further specified herein.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Item</u>
Submittals
Testing, Commissioning, and Training
Earthwork
Concrete
Painting
Equipment General Provisions
Mechanical
Electrical

1.3 **DEFINITIONS**

A. ADJUSTABLE SPEED DRIVE CONTROLLERS

Adjustable speed drives are variable frequency AC drives used to power AC squirrel-cage induction motors at variable frequencies, which relate directly to variable speed. These drives are also commonly known as Variable Frequency Drives (VFDs).

Basic design typically consists of AC to DC conversion followed by AC output wave simulation using pulse-width modulation (PWM). This simulated output power signal will appear to the motor as a representation of an adjustable frequency sine wave. This output may be electrically noisy.

B. ANALOG I/O

Analog I/O are PLC input/output electronic signals that are contiguous over time. Analog signals represent a large number of values within a specific range.

C. ATTICS

Attics shall be considered those closed environments between ceilings and roofing that allow full entry of personnel by use of ladders, pull-down stairs, or other special means.

ATTICS are considered dry crawl spaces (see CRAWL SPACES).

Tight spaces between ceilings and roofs that do not allow full entry of personnel are considered concealed areas (see CONCEALED AREAS).

D. CONCEALED AREAS

Locations that are underground, within walls, or within other areas that do not allow full entry of personnel are considered concealed. Concealed areas are not exposed (see EXPOSED AREAS) or accessible (see ATTICS and CRAWL SPACES).

E. CONTROL PANELS

Control Panels shall be defined as enclosures that contain electrical devices capable of controlling, altering, indicating or displaying the function or conditions of electrical circuits. Unlike junction boxes, Control Panels are not just used for the redirection or reconnection of electrical circuits.

F. CONVENIENCE RECEPTACLES

120 Vac general-purpose receptacles that are not dedicated to a specific function or piece of equipment. Receptacles dedicated to computers, heat tracing, fans, louvers, and etc., are not considered convenience receptacles.

G. CRAWL SPACES

Crawl spaces shall be considered those closed environments that are not normally accessible to personnel, but that allow full entry of personnel by special means.

Crawl spaces are considered exposed areas and may be dry or wet (see ATTICS).

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H. DAMP AREAS

Damp areas are considered wet (see WET AREAS).

I. DEDICATED RECEPTACLES

Dedicated receptacles are provided for a specific receptacle load such as computers, heat tracing, fans, louvers, metering pumps, sump pumps, and etc. Dedicated receptacles are not intended for general use.

J. DIGITAL I/O

A digital I/O point consists of a single input or output binary bit at one of two possible states, which may be represented as 1's or 0's, ON or OFF, YES or NO, TRUE or FALSE, etc. Digital I/O may also be called "discrete" I/O. Within these specifications, both terms are synonymous.

K. DRY AREAS

Locations not normally subject to dampness or wetness. A location classified as dry may be temporarily subjected to dampness or wetness, as in the case of a building under construction (see FINISHED AREAS).

Rooms containing process water, chemical piping, or related equipment are not considered DRY. Areas that are not considered DRY are considered WET.

L. EXPOSED AREAS

Locations that are visible, outdoors, or exposed to a process or room environment. Exposed areas are not concealed (see CONCEALED AREAS).

M. FINISHED AREAS

Indoor confined areas that are not directly exposed to a process or process chemicals. They typically include closed offices, bathrooms, laboratories, lunch/break rooms, etc. Finished areas are considered DRY.

N. HOT SPARE

A "Hot Spare" is a PLC analog or digital channel in a PLC card that is powered but the channel is unassigned. Hot spares are connected to fused field I/O terminal block groups per Specification 16940.

O. INDOOR AREAS

Confined locations where the equipment is normally protected from wind, dust, rain, snow, and other natural elements. INDOOR areas are not the same as DRY areas.

P. I/O

Inputs/Outputs – Input and output signals into and out of a PLC or RTU.

Q. OIU

Operator Interface Unit – A graphical display of industrial plant system variables and status. It may also allow for process control adjustments. Navigation of its programming may be via keypad, touch screen, or a combination of both. An OIU is typically located on a field control panel or control panel in an electrical equipment room.

An Operator Interface Unit is considered a possible extension of a PLC, like an I/O or network card. PLC installations may or may not not include an OIU.

R. OUTDOOR AREAS

Locations where the equipment is normally exposed, or partially exposed, to weather in the form of wind, dust, rain, snow, and other natural elements.

S. PROCESS AREAS

Process areas are those areas that are directly exposed to process moisture, or that may be subjected to moisture in the event of a process leak or failure. They typically include pump rooms, chemical rooms, and direct process-exposure areas such as clearwells, open filters, and reservoirs. Process areas are considered WET.

T. PLC

Programmable Logic Controller – A device used to monitor and control system process. It can be used stand-alone or in conjunction with other systems such as SCADA. It may provide telemetric functions or interface with telemetric equipment.

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U. SHOP FABRICATED

Manufactured or assembled equipment for which a UL test procedure has not been established.

V. VARIABLE FREQUENCY DRIVES (VFDs)

See ADJUSTABLE SPEED CONTROLLERS in this Section.

W. VIBRATING EQUIPMENT

Equipment that is subject to vibration under normal operating conditions, such as motors, transformers, electrically operated valves, etc.

X. WET AREAS

Locations outdoors, underground, directly or indirectly exposed to the process, in concrete slabs or masonry in direct contact with the earth, or in any other way subject to saturation with water or other liquids.

1.4 REFERENCES

Unless otherwise noted, the requirements of the following code-making authorities and standard organizations apply:

<u>References</u>	<u>Title</u>
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society of North America
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRTL	National Recognized Testing Laboratory
OSHA	Occupational, Health, and Safety Administration
UL	Underwriters Laboratories, Inc.
UL 508	Safety Industrial Control Equipment
WAC 296-46B	Washington Administrative Code, Electrical Safety
	Standards, Administration, and Installation

In case of conflict or disagreement between codes, standards, laws, ordinances, rules, regulations, plans, and specifications, the more stringent condition shall govern.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Prior to submittal of shop plans, coordinate all electrical equipment, particularly motor control equipment, process and control panels, and instrumentation, with related manufacturers and with other applicable equipment and systems specified in other divisions of the Specifications.
- C. Provide submittals in the following manner:
 - 1. Organize the submittals by CSI code type.
 - 2. Clearly show the Tag Number associated with each submittal within each CSI grouping.
 - 3. Include non-tagged devices such as grounding systems, conduits, wireway, ductbank details, wire, cable, boxes, fittings, switches and receptacles.
 - 4. Clearly show the specific part, part number, order code, etc. associated with the device. Use pointers, highlights, circles, etc. to clearly identify the specific part.
 - 5. Submit on distribution equipment, including but not limited to: Unit substations, Medium voltage switching equipment, motor control centers and control equipment, low voltage switchboards, safety switches, dry-type (specialty) transformers, panelboards, and grounding.
 - 6. Submit on generators and automatic transfer switches.
 - 7. Submit on lamps, lighting, site lighting, and wiring devices.
- D. Provide manufacturer's product technical data including, but not limited to:
 - 1. Manufacturer's name, address, and contact number.
 - 2. Manufacturer's product descriptive bulletin.
 - 3. Nameplate data, current, voltage, load, impedance, and other electrical data pertinent to the Project and necessary to assure compliance with the Specifications and Plans.

E. Clearly, indicate on submittals that the equipment or material is NRTL listed or is constructed of listed or recognized components. Where a NRTL standard has not been established, clearly identify that no NRTL standard exists for that equipment.

F. OPERATION AND MAINTENANCE MANUALS

Reference base requirements in specification 01300.

Manuals for the electrical system shall also include:

- 1. Manuals for fabricated control panels. Wiring diagrams shall include updated title block showing the date redline field changes were incorporated into the documentation.
- 2. In each section, compile a spare parts list and supplier index.
- 3. Assemble records of all tests, measurements, and calibration settings made for each device.
- 4. The Contractor shall supply three CD-Rom or USB copies of the final equipment manuals in a tabbed, searchable, .pdf format, with a table of contents bookmarked to provide a navigation link to each section of the manual(s).

1.6 SYSTEM DESCRIPTION

- A. Provide the labor, materials, and equipment necessary to furnish, install, and place into operation complete power, lighting, control, alarm, communications, and instrumentation electrical system of this Contract as shown on the Plans or Specifications herein.
- B. Provide a functioning system(s) in compliance with manufacturer's instructions, performance requirements as specified or indicated, and modifications resulting from reviewed shop plans and field coordinated plans.
- C. Provide complete wiring and controls for all equipment specified under other divisions and that comply with Division 16.
 - 1. Connect motors, controls, meters, and any other electrical device installed or provided as part of the project.
- D. Pay and make arrangements for necessary permits, licenses, and inspections.

1.7 QUALITY ASSURANCE

A. TESTING AGENCY QUALIFICATIONS

A "Nationally Recognized Testing Laboratory" (NRTL) recognized and approved by the State of Washington.

- 1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies, or equal, to supervise onsite testing specified in Part 3.
- B. Comply with NFPA 70 (NEC) for components and installation.

C. LISTING AND LABELING

Provide products specified in this Section that are listed and labeled.

- 1. The Terms "Listed and Labeled:" As defined in the National Electrical Code, Article 100.
- 2. Listing and Labeling Agency Qualifications
 - a. A NRTL recognized and approved by the State of Washington.

1.8 DELIVERY, STORAGE AND HANDLING

Ensure that equipment is not used as steps, ladders, scaffolds, platforms, or for storage – either inside or on top of enclosures. Protect nameplates on electrical equipment from being defaced. Repair or replace damaged, corroded, and rejected items at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Refer to individual Division 16 sections.
 - 1. Similar equipment shall be provided by only one manufacturer throughout the project unless otherwise noted in the Specifications.
- B. Submit requests for substitution in accordance with Section 01300.

- C. Trade names and catalog numbers may be used in the Plans or Specifications to establish quality standards and basis of design:
 - 1. Other listed manufacturers in the applicable specification sections with equal equipment may be acceptable.

2.2 GENERAL PRODUCT REQUIREMENTS

- A. Except as otherwise indicated, provide new materials and equipment, which are standard products of manufacturers, regularly engaged in production of such equipment. Provide material or equipment approved and labeled for the purpose for which it is to be used by NRTL or other organizations acceptable to the State of Washington Department of Labor and Industries.
- B. Where voltage, current, power, temperature or other ratings are specified that do not correspond to standard ratings of the manufacturer selected by the Contractor, furnish the next rating level which is more conservative or increases the capacity of the device or material in question.
- C. Furnish materials, devices, and equipment that are non-corrosive or coat them in a manner that renders them non-corrosive and acceptable to the Engineer. Do not provide materials, which contain polychlorinated biphenyls, asbestos, or other hazardous or detrimental materials. Do not install materials in a location or construction manner that produces galvanic action or do not install material combinations with corroding or eroding action.
- D. Where changes in the work, or substitutions in material are proposed, ensure that sizes, weights, openings, etc., are provided that do not require changes in the work outside this Division.
- E. All terminals shall be suitable for 75 degrees C rated copper conductors.

2.3 FABRICATION

A. When equipment is shop fabricated specifically for this Project, use electrical devices and enclosures, which are NRTL, listed and labeled or recognized.

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B. SHOP OR FACTORY FINISHES

- 1. See Division 11 and Section 09900.
- 2. Interiors of other painted electrical equipment shall be either white or light gray.
- C. Fabricate equipment or devices in the field equivalent in every respect to manufactured items used for the same purpose. Where cutting, drilling, grinding, etc., is done to galvanize or painted metal, regalvanize, or paint to match original finish.

2.4 SUPPORTING DEVICES

A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.

1. Material

Steel, except as otherwise indicated, protected from corrosion with zinc coating, or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.

2. Metal Items for Use Outdoors or in Damp Locations

Hot-dip galvanized steel, or stainless steel, except as otherwise indicated.

B. ANCHORS

Galvanized steel in dry areas; stainless steel or hot dipped galvanized steel in wet areas.

- 1. Lag screws or Type A tapping screws for wood.
- 2. Rockwell "well-nut" for light loads in masonry.
- 3. Thru-bolt with fender washers for heavy loads in masonry.
- 4. Toggle bolts with springhead for hollow partitions.
- 5. Self-drilling anchors with threaded studs for concrete.

- 6. Clamps or U-bolts for structural steel.
- 7. Self-drilling anchors with extension rods for hollow tile over concrete.

C. SHEET-METAL SLEEVES

0.0276 of an inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.

D. PIPE SLEEVES

ASTM A53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

2.5 ELECTRICAL IDENTIFICATION

A. MANUFACTURER'S STANDARD PRODUCTS

Where more than one type is listed for a specified application, selection is Installer's option but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and Specifications.

B. COLORED ADHESIVE MARKING TAPE FOR RACEWAYS, WIRES, AND CABLES

Self-adhesive vinyl tape, not less than 3 mils thick by 1 inch wide.

C. UNDERGROUND LINE WARNING TAPE

Provide bright-colored, vinyl tape not less than 3-mils thick by 6-inches wide compounded for direct-burial service with permanent and continuous print.

D. TAPE MARKERS

Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

E. COLOR-CODING CABLE TIES

Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

F. FASTENERS FOR PLASTIC-LAMINATED AND METAL SIGNS

Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

G. FLASH PROTECTION WARNING

Provide Arc Flash Warning Label on all equipment as required by 110.16 NEC (2020). The label is to contain the following text:

WARNING or DANGER Arc Flash Hazard! Follow requirements in NFPA 70E for safe work practices and appropriate PPE. Failure to comply can result in death or injury.

2.6 TOUCHUP PAINT

Use touchup paint on equipment provided by equipment manufacturer and select color to match existing equipment finish.

A. FOR NON-EQUIPMENT SURFACES

Matching type and color of undamaged, existing adjacent finish.

B. FOR GALVANIZED SURFACES

Zinc-rich paint recommended by equipment manufacturer.

PART 3 EXECUTION

3.1 ELECTRICAL SUPPORTING METHODS

A. WET AREAS

- 1. For pullboxes and equipment vaults, reference Specification Section 16130.
- 2. For wet areas which are not pullboxes or equipment vaults, hot-dip galvanized materials, stainless steel materials, or nonmetallic, U-channel system components unless otherwise noted on the Plans.

B. DRY AREAS

Hot-dip galvanized materials unless otherwise noted on the Plans.

C. METHODS

Support raceway, equipment, and devices from framing members or building structure with sufficient clearance for maintaining and servicing. Provide backing plates, and/or framing material to support equipment, devices, and materials, which are located between the building or facility structure-framing members.

3.2 RECORDS

- A. Maintain and annotate on the job at all times a separate set of Record Drawings in accordance with the General Conditions. Show changes from the Contract Documents, routing of hidden raceways, actual fixture and equipment locations, equipment sizes and dimensions and building outline changes. At the end of the Project, provide the Engineer a complete set of Plans marked in red pencil in a manner consistent with the Contract Plans, indicating the changes made on the job.
- B. Record voltage, current, and megohmeter and ground ohmic resistance test measurements made on the electrical work, the trip units, fuses, and overload relay elements installed in the equipment and the setting of all pressure, flow, level, etc., control devices. When the Project is completed and operating, turn over these records to the Owner.

3.3 COORDINATION

- A. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations. Obtain approval from structural Engineer for penetration of structural components prior to penetrating the component.
- B. Coordinate installation of supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

- D. Coordinate the location of motors, switches, panel connections, and other points of connection with the equipment manufacturers or vendors prior to conduit installation. Route circuits to the actual connection point. Even if removal and reinstallation of building materials is necessary, remove and reinstall conduit, outlet boxes, and other electrical connections, if initial electrical connections are not made to the appropriate equipment location.
- E. Coordinate and schedule connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate and verify work under Division 16 with work under other Divisions, cooperate in locating equipment to avoid interference with work of others, and plan work to harmonize with the work of other trades so that all work may proceed as expeditiously as possible. Coordinate the installing of built-in work, attaching items to buildings, and cutting and patching. Coordinate connecting electrical circuits to components furnished under other Divisions. (Portions of the electrical design are based upon the equipment specified in other Divisions.) No extras are allowed because of moving work required to avoid interference with work of other Contractors.
- G. Coordinate installing electrical identification after completion of finishing work where identification is applied to field-finished surfaces.
- H. Where changes in the work, or substitutions in material are proposed, ensure that sizes, weights, openings, etc., are provided that do not require changes in the work outside this Division.

3.4 INSTALLATION

A. ENCLOSURES FOR USE WITH ELECTRICAL EQUIPMENT

Unless specifically called out otherwise on the Plans, electrical enclosures shall meet the following specification:

1. Dry Areas

NEMA 1.

2. Wet Areas

a. Indoors

NEMA 12 where the enclosure will not be subjected to splashing water or hose-directed water.

b. Outdoors

NEMA 3R where the enclosure will not be subjected to splashing water, hose-directed water, or windblown dust.

3. Exceptions to 1-2

- a. As otherwise indicated on the Plans.
- b. As modified in other Division 16 sections.

4. Standards

- a. NEMA ICS-6, Enclosures for Industrial Controls and Systems.
- b. UL 508A, Standard for Industrial Control Panels.

B. WORKMANSHIP

Install the equipment and materials in a neat and workmanlike manner employing workers skilled in the particular trade and in accordance with the manufacturer's instructions, the National Electric Code, National Electric Safety Code, applicable local regulations, ordinances, and industry standards. A person in charge at the site shall maintain adequate supervision of the work under this division when necessary for coordination with other work.

C. SELF-SUPPORTED EQUIPMENT

Install self-supporting equipment in a level and plumb manner, shimming with full width stainless steel shims, as necessary. Bolt units to the floor with stainless steel expansion anchors and bolts, or weld units to embedded steel channels. Floor or pad shall be level within plus or minus 1/8 of an inch in a square yard before installing equipment. Grout or caulk enclosure to floor or pad. Provide bushings on conduits entering from above or at the side. For conduits entering from below, install grounded insulating bushings bonded to the ground bus or pad.

D. MOUNTING HEIGHT

Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated. Mount enclosures for individual units at 54 inches above floors to centerline of controls unless otherwise indicated in the Plans.

E. ACCESSIBILITY

Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, while minimizing interference with other installations.

F. EQUIPMENT ORIENTATION

Install items parallel and/or perpendicular to other building systems and components, except where otherwise indicated.

G. EQUIPMENT MOUNTED ENCLOSURES

Attach enclosures mounted on equipment with machine screws or clamps as required. Do not drill equipment frames or sheets without permission of supplier/manufacturer or the Engineer.

Do not mount safety switches and external equipment to other equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.

H. COORDINATION

Give right of way to raceways and piping systems installed at a required slope.

I. WALL MOUNTED ENCLOSURES

Stand equipment off wall surfaces a minimum of 1/4 of an inch where enclosures are mounted on walls in WET AREAS with neoprene or plastic shim washers.

J. MISCELLANEOUS SUPPORTS

Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices, except where components are mounted directly to a structural member of adequate strength.

K. SLEEVES

Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

L. FASTENING

Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure.

- 1. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
- 2. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

M. FIREPROOFING

- 1. Do not remove or damage fireproofing materials.
- 2. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.
- 3. Repair or replace fireproofing removed or damaged.

N. PENETRATIONS

Make all penetrations of electrical work through walls and roofs water and weather-tight.

O. MISCELLANEOUS REQUIREMENTS

1. Screen or seal all openings into outdoor equipment to prevent the entrance of rodents and insects.

- 2. Equipment fabricated from aluminum shall not be placed in direct contact with earth or concrete.
- 3. Do not exceed the dimensions indicated for equipment except as approved in writing by the Engineer.
- 4. Do not use equipment or arrangements for equipment that reduce the required clearance or exceed the space allocations.

P. DIMENSIONS

Dimensions indicated for electrical equipment and dimensions indicated for the installation of electrical equipment are restrictive dimensions.

1. Field measurements take precedence over dimensioned plans.

3.5 IDENTIFICATION

A. LABELS

Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment. Conduit labeling is further described in section 16130. The labeling of conductors is further described in section 16120.

B. NOMENCLATURE

Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated on the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.

C. SELF-ADHESIVE IDENTIFICATION PRODUCTS

Clean surfaces of dust, loose material, and oily films before applying.

D. IDENTIFY PATHS OF UNDERGROUND ELECTRICAL LINES

During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above power and communication lines. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches, use a single line marker.

E. ENGRAVED, PLASTIC-LAMINATED LABELS, SIGNS, AND INSTRUCTION PLATES

Engraving stock shall be melamine plastic laminate punched for mechanical fasteners with a minimum thickness of 1/16 of an inch for signs up to 20 square inches, and 1/8 of an inch thick for larger sizes. Engraved legend in white letters on black face. Provide nameplates on equipment enclosures giving the name and circuit identification of the enclosed device/equipment in 1/4 of an inch lettering.

F. PANELBOARD SCHEDULES

For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

G. ARC FLASH HAZARD

Provide and install warning labels for arc flash hazard on all switchboards, panelboards, control panels, motor control centers, and other equipment per the requirements of the NEC and Washington State Administrative Code (WAC).

3.6 CUTTING AND PATCHING

Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.

Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.7 TOUCHUP PAINTING

Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.

Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

3.8 EXTRA MATERIALS

Extra materials in this Section cover all spare parts for electrical devices under this contract and are centrally listed here for clarification and completeness. Spares shall match products installed, and shall be packaged with protective covering for storage and identified with labels describing the contents within.

A. GENERATOR ASSEMBLIES (ASSOCIATED CSI SECTION – 16230)

1. Power Fuses (line power)

Provide 3 spare power fuses of each type and rating.

2. Control Fuses

Provide 10 percent (minimum of two) spare control fuses of each type and rating to cover all motor starters (not per starter).

Provide 1 control fuse puller.

3. Filters

Provide two sets each of lubricating oil, fuel, and combustion air filters.

4. V-Belts

Provide one complete replacement set of all V-belts.

5. Touchup Paint

Provide 1 quart (minimum) of touchup paint matching each color utilized on generator set.

6. Provide spare parts in suitable boxed watertight container marked "GENERATOR SPARE PARTS" and deliver to the Owner. Label with supplier's/manufacturer's name, the model number of the generator set, and the 24-hour service telephone number.

B. PANELBOARDS (ASSOCIATED CSI SECTION – 16440)

1. Cabinet Keys

Provide three spares of each type of key for panelboard cabinet locks.

2. Provide a latching plastic container with a printed label adhered to the lid stating "PANELBOARD SPARE KEYS."

3.9 TESTING NOT REQUIRING THIRD PARTY

Test electrical equipment before energization and placing into service. Report all test results in writing. Where tests disclose a defect in the work, rework, or repair the work at no additional expense to the Owner and retest to confirm the rework or repair until testing confirms that the defect has been corrected. Test in accordance with the manufacturer's installation and testing instructions and the applicable electrical standards (i.e., NEMA, NFPA, IEEE, ISA, ANSI) for the class of equipment

A. CONDUCTOR MEGGER TEST

1. Power Conductor Testing

After pulling and <u>prior to connection</u> perform a Megger test between all power conductors (including the equipment ground) and between each power conductor and earth ground in the following manner:

- a. Perform megger tests at 600 V.
- b. Record ambient temperature and humidity during testing.
- c. Cables or conductors with a steady-state value less than 100 megohms shall be considered "failed".
- d. Failed cables and conductors shall be removed and replaced with new and retested per these specifications.
- e. Provide a Power Conductor Megger Testing Report. A blank copy of this report, specifically associated with this contract, is available from Engineering on request. A copy of these signed test results shall be submitted to the Engineer for approval prior to startup and shall be included in the O&M Manual.

2. Control Conductor Testing

a. Control conductor insulation testing is not required.

3. Instrumentation Conductor Testing

b. Instrumentation conductor insulation testing is not required.

B. CONDUCTOR INSPECTION

On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures

- a. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.2. Certify compliance with test parameters.
- b. Remove and replace conductors with visible insulation damage on conductor ends due to installation in an incomplete or damaged conduit system such as, but not limited to, missing bushings or burrs on conduit ends.

C. MOTOR COMMISSIONING TEST

1. Provide a Motor Commissioning Test Report for each new or refurbished motor. A blank copy of this report, specifically associated with this contract, is available from Engineering on request. Motor Commissioning Test Reports shall be signed by the Contractor and approved by the Engineer prior to energizing the motors. A copy of these signed test results shall be included in the O&M Manual.

D. GROUND TEST

Engage an independent electrical testing organization to perform the test below.

1. Subject the completed GROUNDING ELECTRODE SYSTEM to a 3-point fail-of-potential ground test according to IEEE 81. Perform the test not less than 2 full days after the last trace of precipitation, and without the soil being moistened by any means

other than natural drainage or seepage, and without chemical treatment or other artificial means of reducing natural ground resistance.

Maximum grounding resistance values shall be as listed below:

- a. Equipment Grounding System: 25 ohms.
- b. Main Service, Grounding Electrode System: 5 ohms.
- 2. Provide ground test documents signed by the tester and the contractor and issued and approved by the Engineer <u>prior to energizing the power distribution system.</u>

These documents shall clearly show and describe the methods and equipment used in the test and all relevant readings and findings including ground resistance at each test location and observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

These documents shall clearly state whether the system has passed or not passed and show the point(s) where failure occurred. A copy of these signed test results shall be included in the O&M Manual.

- 3. Where resistance to ground exceeds specified values, notify the Engineer. Check connections of affected equipment and conductors. Replace or repair defective connections or conductors. Provide additional ground rods where the grounding electrode resistance is greater than specified. Revise and repeat testing until resistance is within specifications.
- 4. These specifications apply to the following Section if it is included in this contract: 16060.

3.10 GENERAL TESTING AND INSPECTION

A. PRIOR TO ENERGIZATION

- 1. After installing disconnect switches and circuit breakers, perform visual and mechanical inspection of enclosures and devices.
- 2. Test the equipment and electrical circuits for proper connection, tightness, and absence of undesirable shorts and grounds.

- 3. Check for continuity, visual damage, marking, and proper phase sequence.
- 4. Remove any burrs, filings, or other foreign materials from all enclosures; completely wipe down and vacuum.
- 5. Run a magnet around the bottom of each enclosure and around surfaces that may have collected metal shavings during manufacturing or construction.

B. AFTER ENERGIZATION

- 1. After electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
- Correct malfunctioning units on site where possible and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.
- 3. Test operation, calibration, and settings of the meters, relays, and indicating devices.
- 4. Test all operating controls for proper operation.
- 5. Test all auxiliary equipment, i.e., heaters, thermostats, lights, all illuminated indicating devices and lamps, and all audible alarm devices which are an integral part of transformers and panels to verify that they function properly.
- 6. Check fuses with an ohmmeter. Ring out wiring and busing. Check operation of control and safety interlocks. Check grounding of potential transformers, current transformers, and surge protective devices. Check control connections and tightness at terminal blocks, relays, meters, switches, etc. Tug on each connection to verify a tight connection.
- 7. Check field connections to field devices, PLCs, and motor starters..
- 8. Verify proper communication reliability and data transfer speed on local networks.
- 9. Rework or repair equipment, which performs unsatisfactorily during, or as a result of, testing at no additional expense to the Owner.

10. Additional testing requirements specific to other sections are specified in those sections.

3.11 TEST DOCUMENTS

Test documents, as described above, shall be signed and submitted to Engineering for review prior to energizing associated electrical circuits.

3.12 DEMONSTRATION

Demonstrate to the Owner that the electrical installation is working by operating all electrical systems and equipment. Simulate control and emergency conditions, artificially where necessary, for complete system tests. Demonstrate equipment in accordance with each section in Division 16.

3.13 CLEANING

Clean dirt and debris from all internal and external surfaces. Vacuum out the interior of electrical panels.

Apply touchup paint as required to repair scratches, etc.

Replace nameplates damaged during installation. Thoroughly vacuum the interior of all enclosures to remove dirt and debris.

*** END OF SECTION ***

SECTION 16060

GROUNDING AND BONDING

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes grounding of electrical systems, equipment, and basic requirements for grounding, and protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Sections</u>	<u>Items</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
16120	Conductors and Cables
16130	Raceway and Boxes
WAC 296-46B-250	Grounding and Bonding

1.3 **DEFINITIONS**

A. BONDING JUMPER (from NEC 2017, Article 100 - Definitions, Bonding Jumper, Main)

The connection between the GROUNDED CIRCUIT CONDUCTOR and the EQUIPMENT GROUNDING CONDUCTOR at the service.

B. EQUIPMENT GROUNDING CONDUCTOR (from NEC 2017, Article 100 - Definitions)

The conductive path installed to connect normally non-current-carrying metal parts of equipment together and to the SYSTEM GROUNDED CONDUCTOR or to the GROUNDING ELECTRODE CONDUCTOR, or both. Code requirements associated with equipment grounding is referenced to NEC 250, Section VI – Equipment Grounding and Equipment Grounding Conductors.

C. GROUNDED SERVICE CONDUCTOR

Also called "utility neutral." A conductor used to connect the neutral point of the utility transformer to the neutral point of the service entrance.

See SUSE, SYSTEM GROUNDING.

D. GROUNDING ELECTRODE (from NEC 2017, Article 100 - Definitions)

A conducting object through which a direct connection to earth is established.

E. GROUNDING ELECTRODE CONDUCTOR (from NEC 2017, Article 100 - Definitions)

A conductor used to connect the SYSTEM GROUNDED CONDUCTOR or the equipment to a GROUNDING ELECTRODE or to a point on the grounding electrode system.

F. GROUNDING ELECTRODE SYSTEM

See SYSTEM GROUNDING.

G. SUSE

The term SUSE is an acronym for "SUITABLE FOR USE AS SERVICE EQUIPMENT." It is the point in the electrical grounding system where the SYSTEM GROUNDING CONDUCTORS connect to the EQUIPMENT GROUNDING CONDUCTORS, or the GROUNDED SERVICE CONDUCTOR, or both. For each separately-derived source, this shall occur at the SUSE point. These two points are connected by a BONDING JUMPER.

H. SYSTEM GROUND GRID

The SYSTEM GROUND GRID refers to all portions of SYSTEM GROUNDING. It may be as simple as a pair of ground rods and their associated GROUNDING ELECTRODE CONDUCTORS or a complex ground system with multiple types of GROUNDING ELECTRODES.

I. SYSTEM GROUNDED CONDUCTOR

See GROUNDING ELECTRODE CONDUCTOR.

J. SYSTEM GROUNDING

System Grounding (also referred to as a GROUNDING ELECTRODE SYSTEM) consists of all GROUNDING ELECTRODES, GROUNDING ELECTRODE CONDUCTORS, and associated connecting devices. The GROUNDED SERVICE CONDUCTOR, typically referred to as the

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"utility neutral", is also associated with the system ground. Code requirements associated with system grounding is referenced to NEC 250.50 – Grounding Electrode System.

1.4 SUBMITTALS

Submit under provisions of Section 01300, and Section 16050.

1.5 QUALITY ASSURANCE

See Section 16050.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING PRODUCTS

Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.2 WIRE AND CABLE GROUNDING CONDUCTORS

Comply with Section 16120.

A. EQUIPMENT GROUNDING CONDUCTORS

1. Insulated Conductors

Color coded green, per section 16120.

2. Sized in compliance with NEC Table 250.122 or as shown on the Plans, whichever is larger.

B. GROUNDING-ELECTRODE CONDUCTORS

1. Bare Conductors

Soft drawn stranded copper meeting ASTM B8.

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2. Sized in compliance with NEC Table 250.66 or as shown on the Plans, whichever is larger.

C. GROUNDING BRAIDS

- 1. Copper, manufactured, sized at 26,240 circular mils minimum (#6 AWG equivalent).
- 2. Certified C22.2, No. 41, Grounding and Bonding Equipment.
- 3. UL Listings: UL-467 and UL486A.

2.3 GROUND RODS

A. SIZE AND TYPE

- 1. Ground rods shall be 3/4-inch diameter by 10-feet long unless otherwise stated on the Plans.
- 2. Ground rods shall be copperclad steel rods as follows:
 - a. Heavy uniform coating of electrolytic copper molecularly bonded to a rigid steel core.
 - b. Corrosion resistant bonding between the copper and steel.
 - c. Hard drawn for a scar-resistant surface.

2.4 GROUND ROD BOX

A. GROUND ROD BOXES

1. Ground rod boxes shall be "Fogtite Ground Rod Box" or equal.

B. GROUND ROD BOX LIDS

- 1. Ground rods associated with vaults, pullboxes, or handholes that may be subjected to road traffic or heavy loads shall have their ground box lids match the road rating load value of the associated vaults, pullboxes, or handholes.
- 2. The minimum ground rod box lid shall be rated H20.

2.5 CONNECTOR PRODUCTS

A. COMPRESSION CONNECTORS

- 1. Compression type for interior locations:
 - a. Standards: UL 467.
 - b. High copper alloy content.
 - c. Non-reversible.
 - d. Terminals for connections to bus bars shall have two bolt holes.
- 2. Compression type suitable for direct burial in earth or concrete:
 - a. Standards: UL 467, IEEE 837.
 - b. High copper alloy content.
 - c. Non-reversible.

B. BOLTED CLAMPS

- 1. Standards: UL 467.
- 2. High copper alloy content.
- 3. Heavy-duty type.

PART 3 APPLICATION

There are two types of grounding systems covered in this specification; (1) Grounding Electrode Systems and (2) Equipment Grounding Circuits.

- 1. Grounding Electrode Systems shall comply, as a minimum, to the requirements of NEC Sections 250.50 through 250.104, including Table 250.66, "Grounding Electrode Conductor for Alternating-Current Systems."
- 2. Equipment Grounding Circuits shall comply, as a minimum, to the requirements of NEC Sections 250.110 through 250.148, including Table 250.122, "Minimum Size Equipment Grounding Conductors for Grounding Raceway and Equipment."

3.1 GROUND ROD BOX

The connection of Grounding Electrode Conductors to each ground rod shall be accessible through a ground rod box as described herein.

A. Each ground rod shall be provided with a separate ground rod box which shall provide access to the ground rod, its Grounding Electrode Conductor, and its associated ground clamp.

Exceptions:

- Ground rod boxes shall not be required if the ground rod is exposed in a manhole, handhole, or seal-off vault as described in this specification.
- B. Each ground rod box shall be mounted flush to grade.

3.2 GROUNDING ELECTRODE SYSTEMS

Comply with NEC Article 250, Section III for types, sizes, and quantities of Grounding Electrode Conductors, except where specific types, larger sizes, or more conductors than required by NEC are shown on the Plans.

Provide grounding system as shown on the Grounding One Line Diagram of the Plans if provided. When the Plans specifically show, state, or define the method of establishing the SYSTEM GROUND GRID and show the distribution and sizes of the Grounding Electrode Conductors, then these methods shall be followed unless required to be larger by NEC Table 250.66.

A. MANHOLE AND HANDHOLE VAULT GROUNDING

- 1. Provide a ground rod inside each manhole that contains metal parts.
- 2. Install grounding around and inside Manholes, Handholes, and Seal-Off Vaults as described in INSTALLATION; MANHOLE AND HANDHOLE, GROUNDING in Part 4 herein.

B. OTHER GROUNDING ELECTRODE DEVICES AND METHODS

- 1. Hydraulic Piping Systems
 - a. Provide and connect a Grounding Electrode Conductor pigtail to metal hydraulic piping on each major riser.

Connect the conductors to the pipe using NEC-approved hardware and methods.

b. Provide a ground jumper across both sides of a hydraulic piping electrical insulator to continue ground continuity past the insulator.

Exceptions:

- i. Unless specifically stated or detailed otherwise on the Plans.
- c. Ground shall be derived from:
 - i. SYSTEM GROUND GRID
 - ii. System SUSE connection point.

2. Magnetic Flow Meters

a. Provide and connect a Grounding Electrode Conductor to the flow meter manufacturer's ground rings as per the manufacturer's recommendations. Provide a #6 AWG ground conductor unless shown otherwise on the Plans.

Exceptions:

• Unless manufacturer provides documentation verifying that ground rings are not required.

3. Generators

a. In addition to the equipment ground provided with the generator feeder, provide a grounding electrode conductor to the generator's neutral terminal sized per the Plans or per NEC Table 250.66, whichever is larger. Treat this conductor as a neutral wire.

b. Grounding Methods

i. The Grounding Electrode Conductor shall be connected to the neutral terminal of the generator as a neutral. This conductor shall be connected to the grounding system at the SUSE bonding connection.

If required to run through a transfer switch, then this neutral wire shall terminate at the transfer switch's isolated neutral bus before continuing to the SUSE bonding point.

ii. The Equipment Grounding Conductor shall be connected to the metal frame of the generator in compliance with NEC.250.110.

4. Separately Derived Sources

- a. Ground step-down power transformer secondary neutral "XO" terminals to Grounding Electrode Conductors.
 - System Ground Grid
- b. Ground step-down power transformer secondary neutral "XO" terminals to Grounding Electrode Conductors.

3.3 EQUIPMENT GROUNDING

Comply with NEC Article 250, Section VI for sizes of Equipment Grounding Conductors, except where specific larger sizes are shown on the Cable and Conduit Schedule in the Plans.

A. EQUIPMENT GROUNDING CIRCUITS

Install insulated Equipment Grounding Conductors with circuit conductors in the manner listed below and in compliance with Code.

1. Service and Feeders.

Bond the Equipment Grounding Conductor to the equipment to which the circuit connects and to the raceway if it is metallic.

- 2. Single-phase motor or appliance branch circuits.
- 3. Three-phase motor or appliance branch circuits.
- 4. Flexible raceway runs.

B. EQUIPMENT GROUNDING CONDUCTORS

Equipment Grounding Conductors shall be insulated and color-coded green.

Mason County PUD No. 1
Manzanita Reservoir and Booster Pump Station
G&O #22260 16060-8

C. ISOLATED GROUNDING-RECEPTACLE CIRCUITS

Install a separate insulated Equipment Grounding Conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at the Equipment Grounding Conductor terminal of the applicable derived system or service, except as otherwise indicated.

D. NONMETALLIC RACEWAYS

Install an Equipment Grounding Conductor in nonmetallic raceways unless they are designated for telephone or data cables. Bond the conductor at each end to grounded metallic raceway or equipment.

E. METALLIC RACEWAYS

Install grounding bushings at the end of each conduit and connect to the equipment ground or GROUNDING ELECTRODE SYSTEM.

3.4 FREE-STANDING ELECTRICAL SUPPORT STRUCTURES

Metal support structures used to support electrical equipment, devices, cabinets, panels, or enclosures shall be connected to the GROUNDING ELECTRODE SYSTEM by Grounding Electrode Conductors sized as shown on the Plans or per NEC Table 250.66, whichever is larger. Provide a ground conductor to each vertical support member within 6 inches after rising out of the concrete pad.

PART 4 EXECUTION

4.1 INSTALLATION

A. GROUNDING ELECTRODE CONDUCTORS IN RACEWAYS

1. GROUNDING ELECTRODE CONDUCTORS shall not be installed in metallic raceway. Where required to be in raceway, use PVC-Schedule 80 unless shown otherwise on the Plans. Reference Specification Section 16130.

Ground electrical systems and equipment according to NEC requirements, except where Plans or Specifications exceed NEC requirements.

Coordinate grounding connections made to the water system with the mechanical work and install bonding jumpers wherever deemed necessary.

B. MANHOLE AND HANDHOLE GROUNDING

- 1. Provide a ground rod inside each handhole that contains metal parts.
- 2. Expose a minimum of 4 inches of the ground rod above the floor for field inspection and connections to the rod.
- 3. Connect the manhole/handhole/seal-off vault SYSTEM GROUND GRID to the main SYSTEM GROUND GRID with Grounding Electrode Conductors sized per NEC Table 250.66 unless shown larger on the Plans. The minimum conductor size shall be #6 AWG.
- 4. Connect the Grounding Electrode Conductor to each metal lid with braided ground conductors of equivalent size and ampacity of the ground ring. Connect braid to metal lids as per manufacturer's recommendations.
- 5. Connect the Grounding Electrode Conductor to each metal device (conduits, cable tray, j-boxes, support structures, etc.).

4.2 CONNECTIONS

A. GENERAL

Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

- 1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
- 2. Make connections with clean, bare metal at points of contact.
- 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to the contact surfaces.

B. EQUIPMENT GROUNDING-WIRE TERMINATIONS

Make the grounding conductor connections to motors or equipment 10 hp and above or 20 amperes and above, with conductor termination and a

5/16 of an inch minimum bolt tapped to the motor frame or equipment housing. Ground connection to smaller motors and equipment may be made by fastening the conductor termination to a connection box.

C. METAL RACEWAY TERMINATIONS

Where metallic raceways terminate at metallic or non-metallic enclosures, panels, or housings, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.

D. CONNECTION TORQUE

Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.

E. COMPRESSION-TYPE CONNECTIONS

Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

4.3 QUALITY CONTROL

A. TESTS

1. Provide ground testing per Specification 16050, Section 3.

*** END OF SECTION ***

SECTION 16120

CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes building wires, cables, and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
RCW 19.28.261	Revised Code of Washington, Exemptions from RCW
	19.28.161 through RCW 19.28.271
16940	Control Panels

1.3 SUBMITTALS

See Section 01300.

Indicate Field Test Reports and interpret their results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

See Section 16050.

PART 2 PRODUCTS

2.1 BUILDING WIRES AND CABLES

A. STRANDING

- 1. All power, control, and instrumentation conductors larger than #20 AWG shall be stranded.
- 2. All equipment ground conductors larger than #16 AWG shall be stranded.
- 3. All grounding electrode conductors larger than #10 AWG shall be stranded.

B. POWER AND CONTROL WIRE

All power and control wire and conductors in raceways shall be rated 600 VAC.

- 1. XHHW, XHHW-2
 - a. Conductor

Class B, stranded, annealed, uncoated copper. Conductors shall comply with:

- i. UL Standard 44.
- ii. ASTM-B3, ASTM-B8, and ASTM-B7B8.
- b. Insulation

Cross-Linked Polyethylene (XLP) High Heat Water Resistant. Insulation shall comply with:

- i. UL-83 Thermoplastic-Insulated Wires and Cables.
- ii. UL-1063 Machine-Tool Wires and Cables.
- c. The cable shall meet the following Standards and Agency approvals:
 - i. NEMA WC70/ICEA S-95-658.
 - ii. ASTM Stranding Class B3, B8, B7B8
 - iii. Federal Specification A-A-59544
- C. INSTRUMENTATION, COMMUNICATION, AND NETWORKING CABLES

All instrumentation, communication, and networking cables and conductors in raceway shall be rated 600 VAC.

Exceptions:

- Telephone cables.
- Antenna cables.
- 1. Analog Instrument Cables

Paired and triad analog instrument cables shall be #18 AWG stranded tinned copper 600 V tray cable, rated for wet applications at 75 degrees C in a sunlight resistant PVC jacket. Cables shall be plenum and direct burial rated, and shall be provided with individual pair/triad isolated 100 percent foil shields with independent drain wires and an overall isolated shield with drain wire.

These cables shall also be used for totalizing pulse signals from flow meters.

The following cables shall be used for multiple conductor applications:

- a. 2-Conductor, 1 twisted pair, 100 percent overall shield. Belden #9341 or #1120A or equivalent.
- b. 3-Conductor, 1 twisted triad, 100 percent overall shield. Belden #1121A or equivalent.
- c. 4-Conductor, 2 twisted pairs, 100 percent individual shields plus 100 percent overall shield. Belden #1048A or equivalent.

D. CONTROL AND POWER CABLE/CORDS

1. HVAC Cables

HVAC cables shall only be used as control cables between HVAC equipment and thermostats or other controlling devices.

a. 4-Conductor, #16 AWG, stranded, 600V, tinned copper, cabled, PVC insulation, and PVC jacket. Beldon #8620 or equivalent.

b. 5-Conductor, #16 AWG, stranded, 600V, tinned copper, cabled, PVC insulation, and PVC jacket. Beldon #9620 or equivalent.

2.2 SPLICES, TAPS AND TERMINAL BLOCKS

Splices are only allowed under the conditions of Section 4.2.E.

A. SPLICES TO POWER CONDUCTORS

- 1. Splices in Outdoor Areas, Handholes, Vaults, or Direct Buried
 - a. For inline butt splices, use inline resin splice kits for non-shielded cables, 600 V; 3M Scotchcast 82-A series or equal. UL listed 486D.
 - b. For odd-shaped and odd sized splices, use multi-mold resin splice kits for non-shielded cables, 600 V; 3M Scotchcast 85-14CP or equal. UL listed 486D
- 2. Indoor Splices and Taps for Receptacles and Lighting
 - a. Use quick spin, wing torque Electrical Spring and Grounding Connectors; 3M 312, 412, 512, and 512G or equal.

3. Motor Lead Connectors

a. Motor terminal connectors shall be insulated multiple tap connectors rated for 600 Vac; N.S.I. Polaris or equal.

4. Power Terminal Blocks

- a. All power terminals shall be 600 Vac, suitable for 75 degrees C rated copper conductor.
- b. Power terminal blocks may be copper or aluminum and shall have a short circuit current withstand rating following the guidelines described in UL 1059 and shall meet or exceed the available bolted fault current at the point of application.

B. SPLICES TO CONTROL CONDUCTORS

1. In Junction Boxes and Handholes

Splices to control conductors in junction boxes and handholes shall be made with 600 V, UL486D certified, water-proof direct bury connectors with strain relief, pre-filled with waterproof and corrosion-proof, non-hardening, silicone dielectric sealant; DRYCONN DBSR Series or equal.

C. SPLICES TO INSTRUMENTATION CABLES AND CONDUCTORS

1. In Junction Boxes

Strip back the cable outer sheath exposing cable conductors and shield lengths to 1-inch or less. Twist the wires together and solder. Insert and engage into 600 V, UL486D certified, water-proof connectors, pre-filled with waterproof and corrosion-proof, non-hardening, silicone dielectric sealant; DRYCONN Aqua Series or equal.

2. In Pull Boxes and Handholes

Instrument cables and conductors are always passed through a junction box inside pull boxes and handholes. Reference "In Junction Boxes" (above) and Specification 16130, Section 4.

3. Terminal Blocks in Panels

Reference Specification 16940 for terminations in Control Panels.

2.3 INSULATING MATERIALS

A. ELECTRICAL INSULATION PUTTY

Scotchfill, or equal.

B. INSULATING ELECTRICAL TAPE

7 Mil/0.18 mm Plasticized PVC, rubber-based adhesive, 200 percent elongation, 26 N/cm tensile strength, 8 kV breakdown voltage, meeting CE, CSA, UL certifications.

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C. CONDUCTOR COLOR-MARKING TAPE

7 Mil/0.18 mm Plasticized PVC, rubber-based adhesive, 200 percent elongation, 26 N/cm tensile strength, 8 kV breakdown voltage, meeting CE, CSA, UL certifications, in required color.

D. ELECTRICAL HEAT SHRINK TUBING

Heat shrink tubing shall be dual-wall polyolefin, 3-1 shrink ratio, 600 Vac, -55 to 110 degrees C operating range meeting UL 224 600V, 125 degrees C.

PART 3 APPLICATIONS

3.1 WIRE APPLICATIONS

A. CABLE AND CONDUIT SCHEDULE

The Cable and Conduit Schedule shall be considered absolute. No changes to wire sizes, wire count, insulation type, or circuit type shall be allowed without approval from the Engineer.

B. WIRES IN RACEWAYS

Wires installed in raceways shall be considered "FIELD" wiring and shall be installed and terminated by qualified and licensed electrical contractors.

Exceptions:

- Installation and termination may be by the owner under the provisions of "RCW 19.28.261, Exemptions from RCW 19.28.161 through RCW 19.28.271."
- If the raceway is installed inside a control panel fabricated by a certified UL 508 shop, then these wires may be installed and terminated per the provisions of WIRES IN CONTROL PANELS as listed below.

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1. Power Wire

a. Insulation

All service, feeder, and branch circuit conductors shall be XHHW-2.

Exceptions:

 Unless called out otherwise in the Cable and Conduit Schedule.

2. Class 1 and 2 Control Wire

a. Insulation

All control circuits in raceways shall be XHHW-2.

b. Minimum control wire size in conduits and raceways

The minimum control wire size in conduits and raceways shall be #14 AWG.

C. WIRES IN CONTROL PANELS

Wires in control panels are those that are terminated within a control panel, and do not extend beyond the control panel enclosure. Wires that extend beyond the control panel enclosure shall be installed and terminated per the provisions of "WIRES IN RACEWAYS," above.

1. Control Panel Power and Control Wire

a. Insulation

Power and control conductors in control panels shall be MTW or THHN/THHN-2.

b. Wires shall have the following minimum sizes and colors:

Circuit Type	Wire Size ⁽¹⁾	Wire Color	
120 VAC Power Circuits			
120 VAC, Line	#14 AWG	Black	
120 VAC, Neutral	#14 AWG	White	
120 VAC, Equipment	#14 AWG	Green	
Ground			
120 VAC Control Circuits			
120 VAC, Line	#18 AWG	Black	
120 VAC, Neutral	#18 AWG	White	
Low-Voltage AC Control Circuits			
Low-Voltage, Line	#18 AWG	Red	
Low-Voltage, Neutral	#18 AWG	White	

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Circuit Type	Wire Size ⁽¹⁾	Wire Color	
24 VDC Power Circuits			
+24 VDC Power	#14 AWG	Blue	
24 VDC Common	#14 AWG	White with Blue	
		stripe	
24 VDC Equipment	#14 AWG	Green	
Ground			
Isolated (Shield)	#12 AWG	Yellow with Green	
Ground		stripe ⁽²⁾	
24 VDC Control Circu	iits		
+24 VDC Control	#18 AWG	Blue	
24 VDC Common	#18 AWG	White with Blue	
		stripe	
PLC I/O Circuits			
DC I/O	#18 AWG ⁽³⁾	Purple	
DC I/O Common	#18 AWG	White with Purple	
		stripe	
Analog Inputs	#18 AWG	Analog Instrument	
		Cable ⁽⁴⁾	
Analog Outputs	#18 AWG	Analog Instrument	
		Cable	

Notes:

- (1) Wire sizes are minimums; size wires to comply with NEC and UL 508.
- (2) Isolated (Shield) ground wires shall be of a color scheme that is approved for ground wires but distinct from equipment grounds.
- (3) For PLC digital outputs, conductors may be #18 AWG between the PLC output terminal and the buffer relay coil when fused at not more than 5A. Wiring from the buffer relay output contacts to field terminals shall be #14 AWG minimum. For retrofit panels without buffer relays, digital output wiring shall be #14 AWG.
- (4) Contractor shall provide one of the Analog Instrument Cables described in the "PRODUCTS" section of this specification.
- 2. Where panels are required to be manufactured and certified to a particular standard (such as UL 508A), the contractor shall substitute wire colors where required to meet the standard.

PART 4 EXECUTION

4.1 EXAMINATION

Examine raceways and surfaces receiving wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

4.2 INSTALLATION

A. GENERAL INSTALLATION METHODS

- 1. Install wires and cables in raceway system, according to manufacturer's written instructions and NECA's "Standard of Installation," after raceway system is complete.
- 2. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- 3. Install cables and conductors neatly in all enclosures. Bend or form wires in neat runs from conduits to terminals. Arrange wires so that they may be grouped by conduit or function in the enclosure. Install cable ties and straps to support and bundle wires in enclosures. Arrange wires to allow wire tags and numbers to be easily read without bending or flexing wiring.
- 4. Leave 6 inches or more of free conductor at each connected device or equipment terminal and 9 inches of free conductor at each unconnected outlet. Tape free ends of conductors at unconnected outlets and coil neatly in outlet box.
- 5. Install wiring to equipment neutral and grounding blocks on the bottom or furthest back row first. Leave unconnected blocks accessible for future neutral or grounding connections.
- 6. Provide individual neutral conductors for each associated circuit. Common neutral conductors for multi branch circuits are not permitted.
- 7. All power distribution raceways shall contain at least one continuous copper grounding conductor with a minimum size as per NEC 250.122. Larger sizes shall be used if identified in the Cable and Conduit Schedule on the Plans.

B. CONDUCTORS SHARING RACEWAYS

1. Power conductors shall not be run in the same raceway with control conductors.

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Exception:

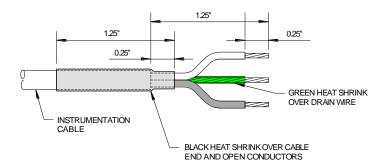
- Unless specifically shown otherwise in the Cable and Conduit Schedule.
- 2. Power conductors shall not be run in the same conduit or raceway with instrumentation cables/conductors.
- 3. Control conductors shall not be run in the same conduit or raceway with instrumentation cables/conductors.

Exception:

• Unless specifically shown otherwise in the Cable and Conduit Schedule.

C. INSTRUMENTATION (SIGNAL) CABLES

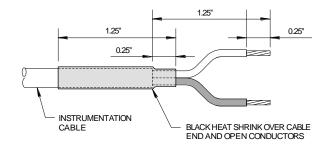
1. Preparing the Shielded End



- a. Neatly trim the end of the cable.
- b. Strip back 1.25 inch of the outer jacket taking care not to cut into the conductor insulation.
- c. Neatly trim the foil back to the edge of the outer jacket taking care not to damage the drain wire.
- d. For signal cables with a braided shield over a foil shield, carefully cut the braid back to the edge of the outer jacket.
- e. Provide a green heat shrink tube over the drain wire, leaving 0.25 inch of exposed conductor.

- f. Provide a 1.25-inch black heat shrink over the jacket, covering 0.25 inch of the exposed conductors. This properly insulates and protects the ends of the shields and the outer jacket.
- g. Strip the signal conductors exposing 0.25 inch of conductor.

2. Preparing the Unshielded End



- a. Neatly trim the end of the cable.
- b. Strip back 1.25 inch of the outer jacket taking care not to cut into the signal conductor insulation.
- c. Neatly trim the foil back to the edge of the outer jacket.
- d. Cut the drain wire at the edge of the outer jacket taking care not to damage the signal conductor insulation.
- e. For signal cables with a braided shield over a foil shield, carefully cut the braid back to the edge of the outer jacket.
- f. Provide a 1.25-inch black heat shrink over the jacket, covering 0.25 inch of the exposed conductors. This properly insulates and protects the ends of the shields and the outer jacket.
- g. Strip the signal conductors exposing 0.25 inch of conductor.

E. SPLICING CONDUCTORS

1. Install service, feeder, and motor circuits continuous without splices from equipment terminal to equipment terminal or motor lead.

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Exceptions:

- Service entry feeders at weatherheads.
- Branch circuits at taps for convenience receptacles and lighting.
- As specifically called out.
- 2. Install instrumentation and control circuits continuous without splices or terminations from source equipment terminal to destination equipment terminal.

Exceptions:

- *On terminal strips in control panels.*
- *On terminal strips in termination panels.*
- As specifically called out.
- 3. Where splicing is allowed, or specifically called out, install in the following manner:
 - a. Splicing Inside Vaults, Handholes, Outdoor J-Boxes, or J-Boxes in Wet Areas

Power and control conductors shall be spliced per Section 2.2.A. Provide a minimum of 24 inches of length on both wires for future re-splicing.

b. Splicing Inside Motor J-Boxes

Power connections inside motor j-boxes shall be made using insulated multiple tap connectors rated for 600 Vac; N.I.S. Polaris or equal. Cover the splice with a minimum of three layers of black insulating electrical tape. Provide a single band with a minimum of two wraps of the appropriate phase color tape to the entry T-lead. Bend the connections away from the sides of the j-box and motor frame to prevent abrasion from motor vibration.

Control connections inside motor j-boxes shall be made with crimped butt-splices with heat shrink covers. The heat shrink shall overlap the butt barrel ends by a minimum of 1/2 inch on each side. Cover the splice with a minimum of three layers of black insulating electrical tape.

F. REPLACING FAULTY CONDUCTORS

When replacing a faulty conductor or cable that shares a raceway with other conductors or cables, all conductors and cables must be removed and replaced with new.

G. CONDUCTOR LABELLING

All conductors shall be labeled in the following manner.

Exceptions:

- Conductors supplying power to lighting and convenience receptacles.
- Non-insulated ground conductors.
- At each motor tag for winding lead numbers. Make all phase rotation changes for motor direction changes at the motor to maintain correct color phase sequence in equipment.
- In each enclosure or box where more than one ungrounded power conductor is spliced or connected, tag for panelboard identification and pole number (reference Section 3.3C.).
- 1. Conductors shall be labeled the same at each end in a place where the label can be clearly read without moving other wires or rotating the label.
- 2. Conductor labels shall reference the device (destination) tag as provided on the "TAG LIST" in the Plans. For example, conductors from panelboard [01 PB 01] to dedicated receptacle [01 DREC 05] shall be labeled as follows:

Line: 01DREC05.L Neutral: 01DREC05.N Ground: 01DREC05.G 3. Conductor labels shall each be unique for each circuit. For example, 10 control conductors from Main Control Panel [02 CP 01] (source) to Automatic Transfer Switch [02 ATS 01] (destination) shall be labeled as follows:

Wire #1: 02ATS01.01 Wire #2: 02ATS01.02

Wire #9: 02ATS01.09 Wire #10: 02ATS01.10

- 4. The labels shall be white heat shrink sized appropriately for the associated conductor with typed lettering in black indelible ink.
- 5. Label each conductor. When terminating cables, if there is insufficient room to provide a label on each conductor, then label the cable sheath.
- 6. Tag for phase rotation at each power connection.

Exception:

• At motor connections.

H. CONDUCTOR COLORS

- 1. For conductor colors inside control panels, reference Section 3.1.C.1.
- 2. Do not use white, gray, green, or green with yellow stripes color for any power, lighting, or control conductor not intended for neutral or equipment grounding purposes.

Exception:

- Instrumentation and control multi-conductor cables may use white, gray, or green singly or as part of a trace color in addition to the base color.
- 3. Equipment grounding conductors: Green or green with yellow stripes.

4. 480/277 volt, 3-phase systems:

Phase A	Phase B	Phase C	Neutral
Brown	Orange	Yellow	Gray

5. 208/120 or 240/120 volt, 3-phase systems:

Phase A	Phase B	Phase C	Neutral
Black	Red	Blue	White

6. 240/120 volt, single phase systems:

Phase A	Phase B	Neutral
Black	Red	White

- 7. Use wire with insulation of required color for conductors of #6 AWG and smaller. For wire larger than #6 AWG, where not available in specified colors, use conductor color marking tape per Section 2.3.C. When conductors are marked in this manner, mark each conductor at all accessible locations such as panelboards, junction boxes, pullboxes, auxiliary gutters, outlets, switches, and control centers.
- 8. Connect power conductors of the same color to the same phase throughout the installation. Viewing all equipment from the front, make connections so phase color sequence is in the same order as that for panelboards, switchboards, motor control centers, etc.

I. PULLING CONDUCTORS

1. Instrumentation, Communication, Networking, and Fiber Cables

Make all cable pulls by hand using a manufacturer-approved pulling compound or lubricant where necessary.

- 2. Power and Control Conductors
 - a. Make all cable pulls by hand where possible. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, or wrapping extra conductor into an eye, that will not damage cables or raceway.

- b. On mechanically-assisted pulls use a manufacturer-approved pulling compound or lubricant where necessary. The compound used must not deteriorate the conductors or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Install pullboxes where necessary to prevent exceeding manufacturer's recommendations.
- 3. Cut cable or conductor ends off after pulling and clean all pulling compound from exposed conductors before terminating.

J. CABLE SUPPORTS

Support cables according to Section 16050.

Provide vertical conductor support per NEC Table 300.19(A).

K. WIRING AT OUTLETS

- Install conductor at each outlet, with at least 6 inches of slack.
 Connect only to receptacle screw terminals using insulated spade-type lugs.
- 2. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer, and in compliance with other Sections of Division 16.

4.3 FIELD QUALITY CONTROL

A. TESTING

1. Provide conductor megger testing per Specification 16050, Section 3.

*** END OF SECTION ***

SECTION 16130

RACEWAY AND BOXES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 RELATED SECTIONS SPECIFIED ELSEWHERE

<u>Sections</u>	<u>Items</u>
01300	Submittals
02530	Utility Structures
16050	Basic Electrical Materials and Methods
16060	Grounding and Bonding
16120	Conductors and Cables
16140	Wiring Devices

1.3 **DEFINITIONS**

A. 100 PERCENT CONTINUOUS

100 percent continuous means that electrical continuity shall be maintained over a conduit's entire length and that such conduits shall consist of only RGS (whether PVC-coated or not), LFMC, or combinations of these types. There can be no break in the electrical continuity by non-metallic components.

EMT conduits are not considered 100 percent continuous.

B. CONDUIT BODIES

A separate portion of a conduit system that provides access through a removable cover to the interior of the system at a junction of two or more sections of the system.

C. CONTROL CONDUITS

Control conduits typically contain cables or conductors in the range of 12 Vdc to 120 Vac. These cables/conductors are used to provide discreet field inputs and outputs to motor drives, PLC controllers, operator stations,

etc. They typically connect to discreet I/O field devices like local panel pushbuttons, indicating lights, selector switches, field limit switches, relay circuits, etc.

D. CONTROL PANELS

Control panels are enclosures in which one or more circuits are changed, unlike junction boxes where circuits are simply routed through the panel. Control panels may be as simple as an enclosure with a pilot light or they may be very complicated with hundreds of I/O terminations. For Control Panel considerations, reference Specification 16940.

E. CONVENIENCE RECEPTACLES

Reference Section 16140, Definitions.

F. DEVICE BOXES

Device boxes are electrical boxes used for receptacles, light switches, dimmers, and other similar devices. Selector switches, indicating lights, displays, etc., are mounted in control panels and equipment enclosures, not in device boxes.

G. DRIP FITTINGS

Drip fittings are used to drain water from conduit entry points, junction boxes, or other enclosures where accumulation of moisture must be removed. They are also intended to disable the entry of foreign materials, including tools and fingers, through the drain.

H. DRY LOCATIONS

Reference Section 16050, Definitions.

I. EMT

Electrical Metallic Tubing (a type of RMC).

J. EQUIPMENT VAULT

An Equipment Vault is a VAULT that contains one or more electrical devices that are terminated within the vault; such as flow meters, control valves, control or power panels, lighting, and etc.

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SEE VAULTS

K. FINISHED AREAS

Reference Section 16050, Definitions.

L. HANDHOLES

A handhole is a pullbox that is not sufficiently sized for entrance of personnel (reference PULLBOXES).

M. INSTRUMENTATION CONDUITS

Instrumentation conduits contain cables and conductors that carry low-power modulated or communication signals. They may include 4-20 mA current loops, 0–10 volt analog signals, 5 to 12 Vdc digital (TLL) data, analog or digital communications signals, etc. They may also include low-voltage compliance power to instruments such as 5 Vdc, ± 15 Vdc, or 24 Vdc.

N. JUNCTION BOXES

Junction boxes are electrical enclosures used for combining, splitting, pulling, or redirecting electrical circuits. Junction boxes may terminate one conduit or join multiple conduits. Circuits are not *altered* inside a junction box. Enclosures where circuits <u>are</u> altered are called CONTROL PANELS. With the exception of terminal strips, junction boxes do not contain electrical devices.

- 1. Junction Boxes, Type J1 not used
- 2. Junction Boxes, Type J2 not used
- 3. Junction Boxes, Type J3

Junction boxes identified as TYPE J3 can contain only instrumentation circuits that are not intrinsically safe.

Junction boxes not containing circuits of the types identified for TYPE J1, TYPE J2, or TYPE J3 are simply called "junction boxes" (without a TYPE identifier).

O. LFMC

Liquidtight Flexible Metal Conduit (a type of RMC).

P. POWER CONDUITS

Power conduits contain branch and feeder conductors with voltages 120 Vac and above. These conductors provide operating power to MCCs, panels, motors, lighting, receptacles, HVAC, etc. Conductors can be of #12 AWG wire gauge and larger, either separate or in power cables.

Q. PROCESS AREAS

Reference Section 16050, Definitions.

R. PULLBOXES

Pullboxes are underground electrical enclosures, sufficiently sized to allow the entrance of personnel, used for combining, splitting, pulling, or redirecting electrical circuits. Pullboxes may terminate one conduit or join multiple conduits. A pullbox can be considered an underground junction box.

Circuits are not altered or terminated inside a pullbox. Pullboxes do not contain electrical equipment or devices.

Exception:

• Pull boxes may include a sump pump.

Handholes are types of pull boxes but are not sufficiently sized to allow the entrance of personnel (reference HANDHOLES).

S. PVC

Polyvinyl Chloride Conduit (a type of RNC).

T. PVC-RGS

Polyvinyl chloride, externally coated RGS (a type of RMC).

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Alias: May be called or shown on Plans and elsewhere in specifications as PVC-Coated RGS or PVC-RMC.

U. PVC-RMC

Reference PVC-RGS.

V. RGS

Rigid Galvanized Steel (a type of RMC).

W. RMC

Rigid Metal Conduit (General NEC Category).

X. RNC

Rigid Nonmetallic Conduit (General NEC Category).

Y. SURFACE RACEWAYS

A metallic raceway that is intended to be mounted to the surface of a structure, with associated couplings, connectors, boxes, and fittings for the installation of electrical conductors.

Z. VAULTS

A vault is an underground structure, serviceable or accessible only from the top. Handholes, Equipment Vaults, and Pullboxes are considered vaults.

AA. WET LOCATIONS

Reference Section 16050, Definitions.

BB. WIREWAYS

Sheet metal troughs with hinged or removable covers for housing and protecting electric wires and cable in which conductors are laid in place after the wireway has been installed as a complete system.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Provide data for surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.

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1.5 QUALITY ASSURANCE

See Section 16050.

1.6 COORDINATION

Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

Coordinate electrical work with outside utilities associated with the project.

Non electrical piping and structural has priority over underground conduit routing.

Exception:

• *Unless specifically coordinated otherwise with the General Contractor.*

PART 2 PRODUCTS

2.1 METALLIC CONDUIT TYPES

A. EMT

1. Conduit

Galvanized steel tubing meeting ANSI C80.3.

- 2. Conduit bodies shall be galvanized, or epoxy coated cast iron or aluminum one piece with galvanized, or epoxy coated cast cover, gasket, and threaded hubs. Use stainless steel screws or other approved non-corroding screws to hold cover in place.
- 3. EMT connectors shall be compression type only. Set screw connectors shall not be allowed.
- 4. Conduit clamps for EMT shall be stamped galvanized steel.

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B. FMC

1. Conduit

Flexible, galvanized steel convolutions forming a continuous raceway.

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2. Connectors

Galvanized steel, screw in, approved for grounding.

C. LFMC

1. Conduit

Flexible, galvanized steel convolutions forming a continuous raceway, covered by a liquid tight PVC layer. Electri-Flex Type LA or American Sealtite, Type UA

2. Connectors

Galvanized steel, screw in, grounding type with a ferrule, which covers the end of the inside and outside of the conduit.

D. RGS

1. Conduit

Hot dipped galvanized with threaded ends meeting ANSI C80.1.

2. Couplings

Steel, cast iron, or malleable iron compression type employing a split, corrugated ring and tightening nut, with integral bushings and locknuts. No indent or set screw type.

a. Couplings

Unsplit, NPT threaded steel cylinders with galvanizing equal to the conduit.

b. Nipples

Factory made through 8 inches, no running threads.

c. Conduit bodies shall be galvanized, or epoxy coated cast iron or aluminum one piece with galvanized, or epoxy coated cast cover, gasket, and threaded hubs. Use stainless steel screws or other approved non-corroding screws to hold cover in place.

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3. Conduit Clamps

Conduit clamps for RGS shall be cast iron.

E. PVC-COATED RGS, PVC-RMC

1. General

- a. A proprietary colored urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.
- b. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30 degrees F (-1 degrees C).
- c. All male and female threads on conduit, elbows, and nipples shall be protected by application of an electronically conducting corrosion resistant compound.
- d. Installation of the PVC coated conduit system shall be performed in accordance with the manufacturer's installation manual.
- e. Conduits and fittings shall meet the following standards:
 - i. ASTM D870
 - ii. ASTM D1151
 - iii. ASTM D3359
 - iv. ASTM D1308
 - v. NEMA RN1

2. Conduit

- a. The PVC coated rigid metal conduit must be UL listed. The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be UL listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL 514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
- b. The conduit shall be hot dip galvanized inside and out with hot dipped galvanized threads.

3. Fittings and Accessories

The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 inches of mercury (vacuum for 72 hours shall be available).

- a. A PVC sleeve extending one pipe diameter or 2 inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
- b. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
- c. Conduit Form 8 Bodies shall be 1/2 inch through 2-inch diameter, shall have a tongue-in-groove "V-Seal" gasket to effectively seal against the elements. Conduit bodies shall be Form 8 and shall be supplied with plastic encapsulated stainless steel cover screws.
- d. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameter of the coated conduit. Al U bolts will be supplied with plastic encapsulated nuts that cover the exposed portions of the threads.

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e. Conduit clamps and fittings for PVC-Coated RGS conduits shall be 316L stainless steel.

4. Approved Material

- a. Plasti-Bond REDH2OT, Perma-Cote, or KorKap manufactured by Robroy Industries.
- b. Ocal-Blue Steel conduit and fittings as manufactured by Ocal, Inc.
- c. Any deviation from the above approved materials must be approved by the Engineer.

2.2 NONMETALLIC CONDUIT TYPES

A. PVC

1. Conduits

NEMA TC 2, Schedule 40 or 80 PVC.

2. Fittings and Accessories

NEMA TC 3; match to conduit type and material, but elbows shall be RMC.

3. Conduit bodies

Where allowed, shall match type, material, and gauge of conduit.

2.3 OUTLET AND DEVICE BOXES

A. STANDARD METAL BOXES

Assembled from stamped steel hot dipped zinc galvanized coated flat pieces, welded or mechanical assembled into a device box, with knockouts for conduit or connector entrance, meeting NEMA OS 1, with plaster or extension rings and necessary mounting appurtenances to suite construction and application.

B. CAST BOXES

1. Cast Aluminum

Epoxy coated cast aluminum box, one piece, with mounting lugs, with threaded holes or hubs, with internal green ground screw and with neoprene gaskets.

2. Cast Iron

Cast iron with electro-galvanized and aluminum acrylic paint finish, one piece, with mounting lugs, with threaded holes or hubs, with internal green ground screw and with neoprene gaskets.

C. DEVICE COVERS

- 1. Plastic: Thermoplastic nylon, device-mount, ivory.
- 2. Aluminum: Sheet Aluminum.
- 3. Cast Iron: Iron alloy.

D. SWITCH ACTUATORS

- 1. Aluminum: Lever-arm type, raintight, cast aluminum matching the metallurgy of the device box.
- 2. Cast Iron: Lever-arm type, raintight, cast iron alloy matching the metallurgy of the device box.

E. WEATHERPROOF COVERS AND PLATES

Weather proof, self-closing, die-cast aluminum, UL listed.

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F. IN-SERVICE COVERS

Shall be weather proof and hinged from top with removable cord slots.

2.4 JUNCTION BOXES, HANDHOLES, AND VAULTS

A. JUNCTION BOXES

1. Standard

Stamped steel, deep drawn one piece (without welds or tab connections), galvanized, with knockouts for conduit or connector entrance, meeting NEMA OS 1. Boxes 6" x 6" x 4" or larger may be code gauge fabricated steel continuously welded at seams and painted after fabrication.

2. Cast

Cast iron with electrogalvanized and aluminum acrylic paint finish, one piece, with threaded cover of the same metallurgy and finish, with mounting lugs, with threaded holes or hubs, with internal green ground screw and with neoprene gaskets; explosion-proof, dust-ignition-proof, raintight, rated for Class I, Division 1 and 2, Groups C, D.

3. Stainless Steel

NEMA 4X 316L stainless steel with gasketed screw down cover.

B. HANDHOLES

1. Material and Strength

Handholes shall be made from Concrete or Polymer Concrete. The boxes and covers are required to conform to all test provisions of ANSI/SCTE 77 2002 "Specification For Underground Enclosure Integrity" for Tier 15 applications (Design Load Vertical 22,500 lbs. and Lateral 800 lbs/sq. ft.) and to be Listed and Labeled. The boxes must physically accommodate and structurally support compatible covers, which possess the Tier rating. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box and cover) are to be manufactured by the same manufacturer. All covers are required to have a minimum coefficient of friction of 0.50 in accordance with ASTM C1028. Independent third-party verification or test reports stamped by a registered Professional Engineer certifying that all test provisions of this specification have been met are required with each submittal. The cover is to have an identifying function

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descriptor imprinted on it. The Descriptor shall be ELECTRICAL, CONTROL, SIGNAL, TELEPHONE, STREET LIGHT, or similar approved by the Engineer.

Handholes with metallic lids shall be grounded per Specification Section 16060.

Handhole lid assemblies comprised of steel shall have a factory-applied galvanized finish.

2. Manufacturers

Quazite (Strongwell Corp.) Carson Industries

PART 3 APPLICATION

3.1 CONDUIT BODIES

This section describes the types of raceways, junction boxes, and device boxes that can used for different circuits and different environments. Reference Section 4.1 for methods and practices required for installation.

A. CABLE AND CONDUIT SCHEDULE

The Cable and Conduit Schedule shall be considered absolute. No changes to wire sizes, wire count, insulation type, circuit type, or conduit size shall be allowed without approval from the engineer.

The Cable and Conduit Schedule does not indicate conduit type (PVC, EMT, RGS, etc.) since, in many cases, a conduit's type may change between its source and destination. The rules stated in this specification define the necessary and allowed conduit type(s) for various applications and routes.

B. RACEWAY REQUIREMENTS

The term "RGS conduits" refers to a type of conduit body and does not imply whether the conduit is PVC-coated or not. Certain applications require RGS conduits with PVC coating, others do not. Reference Section 3.2, "RGS RACEWAY PROTECTIVE COATINGS" for these requirements.

1. Circuit Types and Categories

a. Circuit Types

Conduits are broken into three general circuit types; 1) Power, 2) Control, and 3) Instrumentation (see Definitions).

On the Cable and Conduit Schedule, Power conduits are those starting with the letter "P", Control conduits are those starting with the letter "C", and Instrumentation conduits are those starting with the letter "S".

b. Circuit Categories

Power circuits are broken into two categories, those that contain linear loads and those that contain non-linear loads (see Definitions).

Control and Instrumentation circuits are broken into two categories, those that contain intrinsically safe circuits and those that do not (see Definitions).

These types and categories are listed below in Table 3.1.B.1 below.

Relationships Between Circuit Categories and Conduit Types

Many electrical circuit types do not require special conduit routing considerations. However, Table 3.1.B.1 shows the circuit types where the conduit route must be 100 PERCENT CONTINUOUS (reference Definitions).

Table 3.1.B.1

	100%
Type	Continuous?
Power	No
Control	No
Instrumentation	Yes

2. Conduit Shape

Wiring shall be routed in pipe or tubular conduits, NOT in fabricated wireways or gutters.

C. PVC SCHEDULE 40 RACEWAY APPLICATIONS

1. All straight portions of conduits completely concealed in walls, attics, concrete, or below ground (not exposed) shall be PVC Schedule 40.

Exceptions:

- All Instrumentation conduits shall be 100 percent continuous over their entire length.
- All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.
- PVC conduit areas under roads or heavy traffic areas shall be Schedule 80.
- Where specifically called out otherwise in the Cable and Conduit Schedule.
- 2. All portions of power and control conduits completely concealed inside a reservoir shall be PVC Schedule 40.

D. PVC SCHEDULE 80 RACEWAY APPLICATIONS

- 1. All portions of conduits which contain grounding electrode conductors shall be PVC Schedule 80 and shall contain no metal fittings, connectors, or devices. Such conduits containing grounding electrode conductors shall contain no other types of conductors.
- 2. PVC conduit areas under roads or heavy traffic areas.
- 3. As stated in the Cable and Conduit Schedule.

E. RGS RACEWAY APPLICATIONS

1. All conduits requiring 100 percent continuity per Section 3.1.B.1 shall be RGS over their entire length. For coating requirements, reference Section 3.2.

Exception:

- LFMC conduit shall be allowed per the "LFMC Raceway Applications" section herein.
- 2. Underground factory or bent elbows and offsets greater than or equal to 30 degrees shall be RGS.

Exceptions:

- Where the radius of a conduit bend is greater than or equal to 15 feet per inch of trade size.
- Raceways used for the containment and protection of bare grounding electrode conductors shall be PVC Schedule 80.
 Reference PVC Schedule 80 raceway applications.
- 3. All portions of conduits exposed outdoors shall be RGS.

Exception:

- All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.
- 4. All portions of conduits under covered structures open on any side shall be RGS.

Exception:

- All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.
- LFMC conduit shall be allowed per the "LFMC Raceway Applications" section herein.
- 5. All portions of conduits exposed on the inside of below-ground pullboxes, equipment vaults, wet wells, and dry wells (vaults) shall be RGS.

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- 6. All portions of conduits penetrating concrete floors, walls, or ceilings shall be RGS.
- 7. All conduit penetrations from grade shall be RGS.

Exception:

- All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.
- 8. All portions of exposed conduits inside closed buildings shall be RGS.

Exceptions:

- EMT conduit shall be allowed per the "EMT Raceway Applications" section herein.
- LFMC conduit shall be allowed per the "LFMC Raceway Applications" section herein.
- All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.

F. LFMC RACEWAY APPLICATIONS (REFERENCE DEFINITIONS)

- 1. LFMC conduit shall be used for the last 18 inches of connection to motors, transformers and other vibrating equipment.
- 2. LFMC conduit shall be used for the last 18 inches of connection to any device that may require minor movement during maintenance or repair or that may require physical adjustment.

G. EMT RACEWAY APPLICATIONS (REFERENCE DEFINITIONS)

1. EMT conduits may be used in attics and where concealed in walls.

Exception to the use of EMT:

• Where conduit is required to 100 percent continuous.

3.2 RGS RACEWAY PROTECTIVE COATINGS

Protected RGS conduits are used to minimize conduit degradation from moisture and chemicals.

Where called in the Plans or Specifications as "Protected RGS," "PVC-Coated RGS," "PVC-Coated," "PVC-RGS," or "PVC-RMC," all such conduits, elbows, and fittings shall be factory coated PVC as defined in Section 2.1.

A. PVC-COATED RGS CONDUIT APPLICATIONS

- 1. All portions of RGS elbows, bends, straight pipes, couplings, and fittings buried underground shall be PVC-Coated.
- 2. All portions of RGS elbows, bends, straight pipes, couplings, and fittings encased in concrete shall be PVC-Coated.
- 3. All portions of RGS elbows, bends, straight pipes, couplings, and fittings exposed outdoors shall be PVC-Coated.
- 4. All portions of RGS elbows, bends, straight pipes, couplings, and fittings inside underground vaults, pullboxes, wet wells, and dry wells shall be PVC-Coated.
- 5. All portions of RGS elbows, bends, straight pipes, couplings, and fittings exposed in Chemical Rooms (reference Definitions) shall be PVC-Coated.
- 6. All portions of RGS conduits penetrating concrete floors and below-ground walls and ceilings shall be PVC-Coated at least 12" into the exposed area and extending at least 24" underground.

Exceptions:

- Where specifically noted to be otherwise in the Plans.
- Non-metallic conduits that terminate at the wall of a pullbox.

3.3 JUNCTION AND DEVICE BOX APPLICATIONS

A. JUNCTION BOXES

- 1. Junction boxes for Instrumentation, Intrinsically Safe, and Non-Linear Power circuits (see Definitions) shall be hinged steel, 6" x 6" x 4" minimum.
- 2. Dry Areas (see Definitions).
 - a. Flush-mounted junction boxes may be the standard type.
 - b. Wall-mounted junction boxes shall be the NEMA 1 gasketed.
- 3. Wet Areas (see Definitions).
 - a. NEMA 3R cast aluminum or stainless steel.

B. DEVICE BOXES, ACTUATORS, AND COVERS

All exposed boxes shall be of cast construction.

All aluminum and cast iron covers shall be provided with a weatherproof gasket.

- 1. Outdoors, In Pullboxes, In Equipment Vaults
 - a. Receptacles

Cast iron device box body with cast aluminum gasketed cover and top-opening "in-service" cover.

2. Indoor, Wet Areas (see Definitions).

Boxes mounted in Concrete Masonry Unit (Block) walls shall be Masonry type boxes.

- a. Receptacles
 - i. Surface-mounted cast aluminum device box body with gasketed die cast aluminum, snap-action, weatherproof cover.

b. Light Switches

i. Surface-mounted – die cast aluminum device box body with gasketed cast aluminum switch cover.

3.4 HANDHOLE APPLICATIONS

A. HANDHOLES

Handholes are used as pull and splice points in underground installations and are typically installed in driveways, parking lots, and off-roadway applications subject to occasional non-deliberate heavy vehicular traffic.

1. Handholes shall be set adjacent to each pole light pedestal.

Exception:

• Unless specifically shown or called out otherwise on the Plans.

PART 4 EXECUTION

4.1 EXAMINATION

Examine surfaces and spaces to receive raceways, boxes, for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

4.2 INSTALLATION, GENERAL

A. COORDINATION WITH OTHER WORK

Wherever practical, route conduit with adjacent ductwork or piping.

- 1. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes or other heat sources operating at temperatures above 100 degrees F.
- 2. When installing utility conduits, comply with the spacing and depth requirements of the utilities.
- 3. Non-electrical buried piping has routing priority over electrical burials.

B. MOUNTING PRACTICES

- 1. All conduits in process areas shall be surface mounted unless specifically called out otherwise on the Plans.
- 2. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- 3. Where several conduits follow a common route, stagger pull boxes, junction boxes, pulling sleeves, and fittings.

C. DEVICE BOX INSTALLATION

- 1. Coordinate box locations with building surfaces and finishes to avoid bridging wainscots, joints, finish changes, etc.
- 2. Recess boxes in the wall, floor, and ceiling surfaces in finished areas. Set boxes plumb, level, square and flush with finished building surfaces within 1/16 of an inch for each condition. Set boxes so that box openings in building surfaces are within 1/8 of an inch of edge of material cut-out and fill tight to box with building materials. Back boxes with structural material to prevent rotation on studs or joists. Use gang boxes wherever more than one device is used at one location.
- 3. Surface mount boxes to building structures with a minimum of 1/4-inch spacing and with a minimum of two fasteners. Provide attachments to withstand an additional force of 100 pounds applied vertically or horizontally.
- 4. Set recessed boxes at the following heights to the bottom of the box, except where noted otherwise in the Plan Set:
 - a. Convenience outlet receptacles in finished areas at 18 inches above floor.
 - b. Lighting switches, dimmers, etc., at 42 inches above floor.
 - c. Wall mounted telephones at 60 inches above floor.
- 5. Set surface-mounted receptacle and lighting boxes in wet areas 42 inches above the finished floor to the center of the box, unless called out otherwise in the Plan Set.

- 6. Set surface-mounted boxes for lighting switches within 12 inches of the door opening on the strike or lock side of the door or on the side closing last unless indicated otherwise in the Plan Set.
- 7. Arrange boxes used in wet areas to drain moisture away from devices or enclosures for equipment and make conduit connections from below.
- 8. Set floor boxes level and adjust to finished floor surface.

D. CONDUIT INSTALLATION

Install conduit as a complete and continuous system without wires. Mechanically secure to boxes, fittings, and equipment. Electrically connect conduits to all metal boxes, fittings, and equipment.

- 1. All field or manufactured ferrous metal threaded connections of conduits and fittings shall be installed with a coating of electrically conductive, corrosion resistant, copper colloidal compound such as "Shamrock Kopr-ShieldTM Compound" or equivalent.
- 2. Keep conduits clean and dry. Close each exposed end.
- 3. Properly ground each metallic box, cover, lid, hatch, conduit, etc., in compliance with the National Electrical Code and Specification Section 16060.
- 4. When blowing through conduits, cover electrical components installed in enclosures to avoid blowing dirt, shavings, or moisture into equipment.
- 5. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel, monofilament plastic line, or woven polyester pull line with not less than 200-lb tensile strength. Leave at least 8 inches of slack at each end of the pull wire.
- 6. Install exposed raceways in lines parallel or perpendicular to the building or structural member's lines except if structure is not level then follow the surface contours as much as practical. Do not crossover or use offsets if they can be avoided by installing the raceway in a different routing.

- 7. Run parallel or banked conduits together, on common supports where practical.
- 8. Make bends in parallel or banked runs concentric (common radius point, expanding radius). Use factory elbows only where elbows can be installed concentrically; otherwise, provide field bends for parallel raceways.
- 9. Select surface raceway outlet boxes to which lighting fixtures are attached of sufficient diameter to provide a seat for the fixture canopy.
- 10. Provide surface metal raceway outlet box and the backplate and canopy at the feed-in location of each end-stem suspension fluorescent lighting fixture.

11. Labeling

With the exception of conduits supplying power to lighting and convenience receptacles, all conduits shall be labeled in the following manner.

Conduits shall be labeled at each entrance and exit of a a. raceway, box, and device. Labels shall be placed no more than 3 inches from the relevant entrance or exit and shall be positioned in a manner where they can best be read by technicians and maintenance personnel.

Exception:

- Only one label shall be required for conduits less than 6 feet in length where the entire conduit can be seen from a single point.
- b. The labels used shall be permanent items manufactured specifically for tagging conduits in direct sunlight and wet environments.
- The conduit label shall be the full conduit number as listed c. on the Cable and Conduit Schedule.
- d. The conduit label shall be attached near the ends of conduit. stub ups through floors and penetrations into vaults even if equipment is set over the conduit.

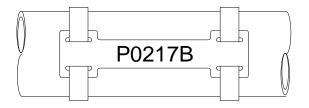


Figure 4.2.D.11

Example of a Conduit Label

E. RACEWAY TERMINATIONS AND CONNECTIONS

- 1. Join raceways with fittings designed and approved for the purpose and make joints tight.
- 2. Make connections waterproof and rustproof by application of a watertight, conductive thread compound. Clean threads of cutting oil before applying thread compound.

3. PVC–RMC Conduits

Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

- 4. Apply PVC adhesive by brush.
- 5. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
- 6. Cut ends of conduit square with hand or power saw or pipe cutter. Ream cut ends to remove burrs and sharp ends. Make conduit threads cut in the field with the same effective length and same thread dimensions and taper as specified for factory-cut threads.

7. Flexible Connections

Use maximum of 18 inches of flexible conduit for equipment subject to vibration, noise transmission, removal, or movement; and for all motors. Do not use flexible conduit in place of elbows, offsets, or fittings to attach to fixed equipment. Recessed and semirecessed lighting fixtures may use up to 6 feet of flexible conduit, or 11 feet of premanufactured lighting "whips." Use

- LFMC in wet or damp locations. Do not strap flexible conduit to structures or other equipment.
- 8. Provide double locknuts and insulating bushings at conduit connections to boxes and cabinets. Align raceways to enter squarely and install locknuts with dished part against the box. Use grounding type bushings where connecting to concentric or eccentric knockouts.

Exception:

- *In wet areas, use Myers hubs.*
- 9. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.
- 10. Support conduit connections to motors or other equipment independently of the motor or equipment. Raise or drop vertically to the nearest practicable point of connection to the unit. Run vertical drops to the floor and fasten with a floor flange.

 Unsupported drops are not permitted. Horizontal runs on the floor or on equipment are not permitted. Drop or raise at the appropriate closest location. Run conduit on equipment frames or supports to closely follow the contours of the equipment. Locate conduit to maintain access to all equipment services and adjustment points and so as not to interfere with operation of the equipment.
- 11. Connect conduit to hubless enclosures, cabinets, and boxes with double locknuts and with insulating type bushings. Use grounding type bushings where connecting to concentric or eccentric knockouts. Make conduit connections to enclosures at the closest point possible where the devices are located to which the circuits contained in the conduit will connect.

Exception:

• In wet areas, connect to enclosures, boxes, and devices from the bottom side using Myer-type hubs.

F. RACEWAY SUPPORT

Support raceways as specified in Section 16050.

- 1. Provide anchors, hangers, supports, clamps, etc., to support the raceways from the structures in or on which they are installed. Do not space supports further apart than 10 feet.
- 2. Provide sufficient clearance to allow conduit to be added to racks, hangers, etc., in the future.
- 3. Support raceway within 3 feet of every outlet box, junction box, panel, fitting, etc.
- 4. Support raceway and boxes in an approved manner by:
 - a. Expansion shields in concrete or solid masonry;
 - b. Toggle bolts on hollow masonry units;
 - c. Wood screws on wood;
 - d. Metal screws on metal.
- 5. Raceway in wet areas shall have clamp backs or other appropriate spacers to hold them a minimum of 1/2 inch off the surface. Horizontal runs on the roof surface shall be blocked at every 5 feet to hold them a minimum of 2 inches above roof surface.

G. INSTALLING PVC-COATED RGS CONDUITS

- 1. Follow the manufacturer's requirements and recommendations when installing PVC-Coated RGS conduits.
- 2. Seal the connections to protect the conduit.
- 3. Provide manufacturer's PVC repair compound where the thickness of the conduit coating has been reduced or damaged (from bending, threading, nicking, etc.)

H. BENDS AND OFFSETS

1. Fabricated bends and offsets shall be made with manufacturer-approved bending tools, by manufacturer-certified personnel.

- 2. Where possible, use standard elbows, conduit fittings, or junction boxes to avoid fabricated bends.
- 3. Make bends and offsets uniform and symmetrical. Make bends and offsets so that the inner diameter is not reduced. Use expanding plugs for bends in PVC conduit of 2-inch trade size or larger. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

I. PENETRATIONS FOR RACEWAYS

1. Do not bore holes in floor and ceiling joists outside center third of member depth or within 2 feet of bearing points. Holes shall be 1-inch diameter maximum.

Exception:

- *Unless specifically approved by Structural Engineer.*
- 2. Penetrate through roofs with core drill hole 1/2 to 1 inch larger than conduit, flash with neoprene, caulk conduit in place and seal with silicone sealant under flashing. Sleeve roof opening where non-concrete roof construction occurs.

4.3 HANDHOLES

A. HANDHOLE INSTALLATION

Install handholes for underground raceway systems true to line and grade. Provide a compacted foundation of fine sand or 3/8 minus crushed rock for the bearing surface edges of the handholes.

The handholes shall be installed per the NEC sections 314, and other applicable sections of the NEC.

B. HANDHOLE CONDUIT INSTALLATION

- 1. End all conduits with a vertical riser.
- 2. Conduits NOT identified as 100 percent continuous shall be allowed to extend into the handhole as a PVC conduit. Provide a PVC bell-end in each conduit as shown in Figure 4.5.B.2. Provide

a removable filler at the end of each conduit to eliminate the possibility of water entry.

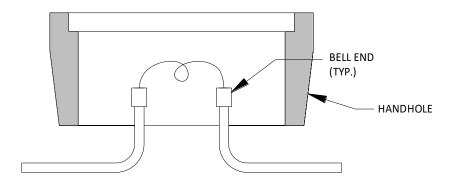


Figure 4.5.B.2

Typical PVC Conduit Terminations in a Handhole

3. Conduits identified as 100 percent continuous shall terminate into the bottom of a TYPE J1, TYPE J2, or TYPE J3 junction box, with Myer-type hubs, in PVC-Coated RGS conduit as shown in Figure 4.5.B.3. The door of the J-Box shall face upwards.

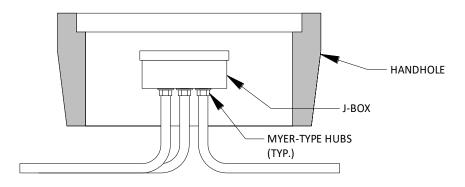


Figure 4.5.B.3

Typical 100 Percent Continuous Conduit Terminations in a Handhole

Exception:

• Where a handhole contains only two conduits, and is being used solely as a pulling point, where one conduit is simply an extension of the other, a junction box may be replaced with a PVC-Coated RGS conduit pulling body.

C. HANDHOLE GROUNDING

1. All handholes with metal conduits or with metal lids shall be grounded per Section 16060-3.

4.4 INSTALLATION OF CONDUITS UNDERGROUND AND IN CONCRETE

A. UNDERGROUND RACEWAYS

1. The minimum conduit depth shall be 24 inches.

Exceptions:

- *Electrical utility conduit depth shall be 36 inches.*
- *Unless required otherwise by utility company.*
- Unless required to be shallower due to physical constraints (see requirements below).
- Unless under a concrete slab (see requirements below).
- Conduits contains a grounding electrode conductor shall be 30-inches deep.
- 2. Conduits that require a buried depth of less than 18 inches shall require a 6-inch-thick concrete covering over that portion of such conduits. Such concrete covers need not be formed but shall be colored red or shall be painted red on top.
- 3. Conduits under a concrete slab-on-grade shall be separated from the slab and from the supporting soil by at least 3 inches with soft sand on all sides.
- 4. Provide separation of underground instrumentation conduits from power and control conduits by a minimum of 12 inches. Avoid parallel runs of instrumentation conduits with power and control conduits as much as possible. Where instrumentation conduits are required to crossover power or control conduits, maintain the 12-inch separation using depth and make the crossover as close to 90 degrees as possible.

- 5. Run conduits as straight as practicable. Make changes in direction and/or grade of sufficient length to allow a gradual change (3-foot radius minimum). Make slight offsets with 5-degree couplings.
- 6. Run trenches true and clear of stones or soft spots. Place 4-inches of fine sand in the trench bottom and tamp into place. Provide preformed plastic spacers on top of sand spaced 5-feet on center.

After the raceway is placed in the trench, backfill 6 inches with sand, then with native earth backfill passing a No. 8 sieve, free of stones. Do not tamp on top of the conduit until the final backfill is placed. Tamp or water-settle the final backfill to finish the grade. Compact the backfill as specified under Section 02300 "Site Earthwork."

- 7. Mark direct buried conduit by placing a red marking tape a minimum of 12 inches below grade during backfilling of the trench.
- 8. Seal conduit connections to eliminate leakage.

B. CONCRETE ENCASED RACEWAYS

Raceways encased in structural concrete must be defined in detail and presented to the Structural Engineer for approval at least 7 days prior to installation. As a minimum, approval will be based on the assurance that there will be no physical interference and that structural integrity will not be jeopardized.

- 1. In general, conduits encased in concrete may take the most direct route providing they do not jeopardize the structural integrity of the slab or interfere with process-related piping or equipment.
- 2. Conduits shall be at least 1-1/2 inches to the edge of a concrete body. If a structural block-out is desired for conduit bundling near the edge of a concrete body, then submit the desired layout to the Engineer for approval and design as defined in this Section.
- 3. Conduit density, crossover, and routing must be minimized and coordinated to assure that structural integrity is not jeopardized.
- 4. At the point-of-exposure out of the slab, conduits must be perpendicular to the slab surface from all angles.

5. No part of an elbow's bending radius shall be seen at the point-of-exposure from the slab.

C. CONDUITS IN ELEVATED SLABS

See "CONCRETE ENCASED RACEWAYS" above.

D. CONDUITS UNDER SLABS ON GRADE

- 1. No conduits will be encased in slabs less than 8 inches in depth.
- 2. For slabs-on-grade, all conduits larger than 3/4-inch trade size must be run underground below the slab.
- 3. All conduits desired to be installed within slabs on grade shall be submitted to the Engineer for approval and design as defined in this Section.

E. CONDUIT TRANSITIONS

Where raceway exits from grade or concrete, provide the following:

1. Only the straight portion of conduits shall exit grade or concrete.

No curved portion of a factory or field-bent conduit shall be visible existing the penetration, even when covered or hidden by equipment.

F. CONDUIT STUB-UPS INTO EQUIPMENT AND ENCLOSURES

- 1. Where conduits are stubbed up into open bottom equipment and enclosures, extend the bottom of the conduit threads 1/2 inch above grade. Provide ground bushing and end fittings, flush with fitting and 2-inch stub, above the bottom of the enclosure. Stub conduits to a uniform height (plus or minus 1/8 of an inch) and align within plus or minus 1/4 inch.
- 2. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends are not visible above the finished slab.
- 3. Unless otherwise noted on the Plans, spare conduits stubbing up through concrete floors and not adjacent to a wall shall be finished flush with floor with an RGS coupling. Provide an in-set metal plug (male thread) into coupling flush with floor.

- 4. Unless otherwise noted on the Plans, spare conduits stubbing up through concrete floors or grade, and adjacent to a wall or housekeeping pad shall extend 12 inches above slab/grade. The exterior edge of the conduit shall be a minimum of 1 inch from the wall/pad.
- 5. All stub-ups shall be provided with pull string.
- 6. Provide conduit labels on all stub-ups which are not flush mounted.

4.5 PROTECTION

Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensures coatings, and finishes are without damage or deterioration at the time of Substantial Completion.

- A. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- B. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

4.6 CLEANING

On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

4.7 QUALITY CONTROL

A. TESTS

- 1. Conduits identified as meeting the requirements of 100 percent continuity shall be tested between source and destination as follows:
 - a. Testing shall be performed using a Digital Voltmeter or Biddle ohmmeter.
 - b. Testing values shall not exceed 5 ohms.

- c. If testing values exceed 5 ohms, then corrective action shall be taken to reduce the resistance to 5 ohms or below.
- d. These measurements shall be documented, signed, and submitted to the Engineer for approval.

*** END OF SECTION ***

SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes the various types of receptacles, connectors, switches, and finish plates.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

Section	<u>Items</u>				
16050	Basic Electrical Materials and Methods				
16130	Raceways and Boxes				

1.3 SUBMITTALS

See Section 01300.

1.4 QUALITY ASSURANCE

See Section 16050.

1.5 COORDINATION

A. WIRING DEVICES FOR OWNER FURNISHED EQUIPMENT

Match devices to plug connectors for Owner-furnished equipment.

B. CORD AND PLUG SETS

Match cord and plug sets to equipment requirements.

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1.6 **DEFINITIONS**

Reference Section 16050, "Definitions."

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include the following:

- 1. Wiring Devices
 - a. Arrow Hart Div., Cooper Industries.
 - b. Bryant Electric, Inc.
 - c. Hubbell Inc.
 - d. Killark Electrical Mfg. Co.
 - e. Leviton Mfg. Co., Inc.
 - f. Pass & Seymour/Legrand.
- 2. Multi-Outlet Assemblies
 - a. Wiremold Co.

2.2 WIRING DEVICES

Comply with NEMA Standard WD 1, "General Purpose Wiring Devices." Terminals shall be rated for 75 degrees C (min.).

A. ENCLOSURES

NEMA 1 equivalent, except as otherwise indicated.

B. COLOR

Ivory except as otherwise indicated or required by Code.

C. RECEPTACLES, STRAIGHT-BLADE AND LOCKING TYPE

Except as otherwise indicated, comply with Federal Specification W-C-596 and heavy-duty grade of UL Standard 498, "Electrical

Attachment Plugs and Receptacles." Provide NRTL labeling of devices to verify compliance.

- 1. General Purpose Convenience Outlets
 - a. Duplex receptacle configuration
 - b. Nylon face
 - c. Staked screw terminals for line, neutral, and ground connections.
 - d. Provisions for split bus
 - e. NEMA 5-20R
- 2. Special Purpose Receptacles
 - a. Staked screw terminals for line, neutral, and ground connections.
 - b. NEMA configuration as indicated.

D. RECEPTACLES, STRAIGHT-BLADE, SPECIAL FEATURES

Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicated, and with the following additional requirements:

1. Ground-Fault Circuit Interrupter (GFCI) Receptacles – Class A (5 mA) Personal Protection

UL Standard 943, "Ground Fault Circuit Interrupters," with integral NEMA 5-20R duplex receptacle arranged to protect only the connected receptacle and no other receptacles connected on the same circuit. Design units for installation in a 2-3/4-inch-deep outlet box without an adapter.

E. CONVENIENCE RECEPTACLES IN WET LOCATIONS

Convenience receptacles in wet locations shall comply with NEC Article 406.9 and shall be 20 A, 125 VAC rated terminated with binding screws.

F. SNAP SWITCHES

Quiet-type ac switches, NRTL listed and labeled as complying with UL Standard 20 "General Use Snap Switches," and with Federal Specification W-S-896.

1. Lighting Switches

120/277 Vac only, rated 20 amperes.

2. Motor Rated Switches

Horsepower rated for application indicated.

G. WALL PLATES

Single and combination types that mate and match with corresponding wiring devices. Features include the following:

1. Color

Matches wiring device except as otherwise indicated.

2. Plate-Securing Screws

Metal with heads colored to match plate finish.

3. Material for Interior Finished Spaces

Lexan, except as otherwise indicated.

- 4. Material for Interior Unfinished Spaces: Galvanized steel.
- 5. Material for Exterior or Wet Locations: Cast Aluminum.

2.3 MULTI-OUTLET ASSEMBLIES

A. Comply with Standard UL 5, "Surface Metal Raceways and Fittings."

B. COMPONENTS OF ASSEMBLIES

Products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.

C. RACEWAY MATERIAL

Metal, with manufacturer's standard corrosion-resistant finish.

D. WIRE

No. 12 AWG.

PART 3 EXECUTION

3.1 INSTALLATION

A. IDENTIFICATION

Each receptacle, whether convenience, or dedicated, shall be labeled with the circuit from which its power is derived. Label as "CKT-XX" where XX = numerical circuit number.

1. Only one Panelboard servicing the site:

Label as "CKT-XX" where XX = numerical circuit number within the Panelboard.

2. More than one Panelboard servicing the site:

Label as "CKT XX-YY" where XX = Panelboard number and YY = numerical circuit number within the Panelboard.

Example:

A receptacle powered from circuit 03 of Panelboard [01 PB 02] would be labeled "CKT 02-03."

B. RECEPTACLE BOXES

- 1. Reference Section 16130 for box types.
- 2. Mounting Height
 - a. Indoor, in WET Areas

Indoor receptacle boxes in WET areas shall be mounted 42 inches above the floor unless shown otherwise on the Plans.

b. Outdoor

Outdoor receptacle boxes shall be mounted 18 inches above grade unless shown otherwise on the Plans.

3. Reference Section 16130 for box cover types.

C. CONVENIENCE RECEPTACLES

Convenience receptacles shall be 20 A, duplex, white, GFCI, straight blade, 3-wire, grounding, unless called out otherwise on the Plans.

In addition to any GFCI requirements, all receptacles, convenience or dedicated, located in break rooms and kitchens shall be AFCI.

D. ARRANGEMENT OF DEVICES

Except as otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

- 1. See "Raceways and Boxes" Section for mounting height of devices.
- 2. Verify locations of outlets and switches in cabinetry with cabinet supplier and Owner prior to installation.

E. INSTALLATION PRACTICES

- 1. Install devices and assemblies plumb, level, flush and secure. Provide spacers on device screws to flush yokes or flanges to surface of wall within 1/16 of an inch where boxes are not flush with the wall surface. Install wiring devices such as receptacles to withstand 50 pounds force applied perpendicular to the device face with a maximum deflection of 1/16 of an inch.
- 2. Protect devices and assemblies during painting.
- 3. Use corrosion resistant devices in kitchen areas and outdoors.
- 4. Wiring connections shall be made by compression on the screw terminals. The wire shall be neatly and symmetrically wrapped around the screw a minimum of 180 degrees.

F. LIGHT SWITCH ORIENTATION

Install switches with the "off" position down. Install three and four way switches so the load is "off" when all switch handles are down.

G. TERMINATION PRACTICES

Connect phase, neutral, and grounding wires to devices with full loops around screws installed to tighten with tightening of the screw. Trim insulation to within 1/8 of an inch of screw terminal.

H. WALL PLATES

Install after painting is complete. Install with an alignment tolerance of 1/16 of an inch to plumb. Install at flush mounted devices so that all four edges are in continuous contact with finished wall surface without the use of mats or similar devices. Do not use plaster fillings.

3.2 GROUNDING

Connect receptacle or switch ground lug to device box for devices other than isolated ground type.

3.3 FIELD QUALITY CONTROL

Test wiring devices for proper connections, polarity, and ground continuity. Perform this testing with testing equipment designed for testing polarity and connections.

Operate each operable device at least six times.

Demonstrate charging the owner's electronic devices at each USB receptacle.

Test ground-fault circuit interrupter operation with local fault simulations, using a tester designed for such testing, and according to manufacturer recommendations. Testing with integral test switches on the receptacle is not sufficient for this testing.

Replace damaged or defective components, and retest.

*** END OF SECTION ***

SECTION 16210

ELECTRICAL UTILITY SERVICES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of electrical service and connection to the commercial power utility system (Power Company) and the work required in conjunction with the Power Company for their revenue metering. For this project the Power Company is Mason County PUD No. 3.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Items</u>
01500	Temporary Facilities
16050	Basic Electrical Materials and Methods
16060	Grounding and Bonding
16120	Conductors and Cables
16130	Raceway and Boxes

PART 2 PRODUCTS

2.1 MATERIALS

- A. Primary circuit to utility transformer, including pole(s), primary cable and utility transformer bank: provided by the Power Company.
- B. Revenue metering: provided by the Power Company.
- C. Meter socket and connecting conduit: provided by the Contractor.
- D. Trench and conduit to base of pole by the Contractor.
- E. 2-inch riser conduit, 40 foot estimated, by the Contractor.
- F. Conductors between the meter base to top of pole plus additional 20 feet, by the Contractor.

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PART 3 EXECUTION

3.1 APPLICATION

Application for service to the Power Company has already been made by Owner.

Coordinate with the Power Company to ensure that their metering and service requirements are met during installation portion.

A. The Contractor is responsible for any work necessary to place the service in operation as a complete installation. Provide any materials required and do any work necessary that is not provided or completed by the Power Company.

3.2 INSTALLATION

- A. The Power Company will:
 - 1. Install the revenue meter.
 - 2. Install the primary conductors, riser conduits, and utility transformer.
 - 3. Mount contractor provided riser conduit to the pole and pull Contractor provided conductors to the top of the pole.
 - 4. Make final termination and connection to the transformer bank.
- B. The Contractor is responsible to provide and/or install the following:
 - 1. Excavation and installation of all materials to base of utility pole.
 - 2. Meter base.
 - 3. Materials as defined in Section 2.1.

*** END OF SECTION ***

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SECTION 16230

GENERATOR ASSEMBLIES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of a packaged liquid-propane fueled engine generator set [03 GEN 01] with accessories as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section	<u>ltem</u>
01300	Submittals
01550	Generator Engine Exhaust System
16050	Basic Electrical Materials and Methods
16060	Grounding and Bonding
16410	Enclosed Switches and Circuit Breakers

1.3 **DEFINITIONS**

A. FULL LOAD

The generator delivering 100 percent of its rated output power.

B. MAXIMUM FREQUENCY DIP AND PEAK

The maximum allowable frequency deviation, in percent, below and above the generator's specified output frequency during application-specific starting and stopping steps as specified in 1.5.

Example: A 10 percent MAXIMUM FREQUENCY DIP AND PEAK on a 480 Vac, 3 PH, 60 Hz generator equates to ±10 percent (±6 Hz) maximum deviation from 60 Hz, or 54 Hz absolute minimum to 66 Hz absolute maximum frequency limits during the worse-case specified step changes while either loading or

unloading.

C. MAXIMUM FREQUENCY RECOVERY TIME PERIOD

The maximum period of time, in seconds, for the frequency to recover back to its specified steady-state operating band following load transitions from no load to full load or from full load no load.

Example: A 5 second MAXIMUM VOLTAGE RECOVERY TIME PERIOD requires that the generator repeatedly recover from full load added or removed load steps within 5 seconds maximum. This means that during a full load transition, in either direction, the generator frequency may deviate from its specified steady-state operating band for a maximum of 5 seconds before it has fully recovered back to its specified steady-state operating band.

D. MAXIMUM STEADY-STATE FREQUENCY OPERATING BAND

The maximum allowable frequency deviation, in percent, below and above the generator's specified operating frequency during steady-state operating conditions at any load between no load and full load.

Example: 0.5 percent MAXIMUM STEADY-STATE FREQUENCY OPERATING BAND on a 480 Vac, 3 PH, 60 Hz generator equates to ±0.5 percent (±0.3 Hz) maximum deviation from 60 Hz, or 59.7 Hz absolute minimum to 60.3 Hz absolute maximum frequency limits at any stable operating load from no load to full load.

E. MAXIMUM VOLTAGE DIP AND PEAK

The maximum allowable voltage deviation, in percent, below and above the generator's specified output voltage during application-specific starting and stopping steps as specified in 1.5.

Example: 25 percent MAXIMUM VOLTAGE DIP AND PEAK on a 480 Vac, 3 PH, 60 Hz generator equates to ±25 percent (±120 Vac) maximum deviation from 480 Vac, or 360 Vac absolute minimum to 600 Vac absolute maximum voltage limits during the worse-case specified step changes while either loading or unloading.

F. MAXIMUM VOLTAGE RECOVERY TIME PERIOD

The maximum period of time, in seconds, for the voltage to recover back to its specified steady-state operating band following load transitions from no load to full load or from full load no load.

Example: A 5 second MAXIMUM VOLTAGE RECOVERY TIME PERIOD requires that the generator repeatedly recover from full load added or removed load steps within 5 seconds maximum. This means that during a full load transition, in

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either direction, the generator voltage may deviate from its specified steady-state operating band for a maximum of 5 seconds before it has fully recovered back to its specified steady-state operating band.

G. MAXIMUM STEADY-STATE VOLTAGE OPERATING BAND

The maximum allowable voltage deviation, in percent, below and above the generator's specified operating voltage during steady-state operating conditions at any load between no load and full load.

Example: 2 percent MAXIMUM STEADY-STATE VOLTAGE OPERATING BAND on a 480 Vac, 3 PH, 60 Hz generator equates to ±2 percent (±9.6 Vac) maximum deviation from 480 Vac, or 470.4 Vac absolute minimum to 489.6 Vac absolute_maximum voltage limits at any stable operating load from no load and full load.

H. NO LOAD

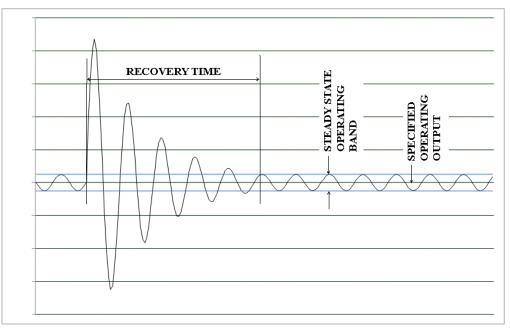
The generator delivering 0 percent of its rated output power.

I. STANDBY POWER OUTPUT RATING

The power output rating equal to the power the generator set delivers continuously under normally varying load factors for the duration of an electrical utility power outage. The power output rating is the gross electrical power output of the generator set minus the total power requirements of the electric motor driven cooling fan, water pump, and other auxiliary loads related to the generator set operations.

J. DEFINITIONS REFERENCE GRAPH

The following graph is a reference chart to better define the following terms "MAXIMUM VOLTAGE RECOVERY TIME PERIOD," "MAXIMUM STEADY-STATE VOLTAGE OPERATING BAND", "MAXIMUM FREQUENCY RECOVERY TIME PERIOD," and "MAXIMUM STEADY-STATE FREQUENCY OPERATING BAND." The Y axis can either be voltage or frequency and the X axis is time.



TIME

1.4 REFERENCES

- A. The latest Washington State adopted, published edition of a reference shall be applicable.
- B. All Washington State amendments adopted prior to the effective date of this Contract shall be applicable.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. National Fire Protection Association (NFPA)
 - a. NFPA 58 Liquified Petroleum Gas Code
 - b. NFPA 37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
 - c. NFPA 70 National Electrical Code
 - 2. International Fire Code (IFC)
 - 3. International Building Code (IBC)

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- 4. National Electrical Manufacturers Association (NEMA)
 - a. NEMA MG 1: Motors and Generators
- 5. International Mechanical Code (IMC)
- 6. Underwriters Laboratory (UL)
 - a. UL 2200 Generator Engine Generator Assemblies
 - b. UL 142 Steel Aboveground tanks for Flammable and combustible Liquids.

1.5 PERFORMANCE REQUIREMENTS

A. Engineering calculations indicate a standby power output rating requirement of 120 kW at 80 percent power factor at 480/277 volts, 3 phase, 60 hertz while operating under the site conditions listed in Part 1.8 of this Section in an ambient temperature range of 0 to 104 degrees F at less than 95 percent rated capacity. The manufacturer shall calculate generator unit size according to the following bus rated loads and starting steps:

Step No./ Device No.	Device Description	Motor Code	Load Hp	Load kVA	Starter Type	No. of Pulses VFD only)
Step 1						
03 PB 01	Panelboard, 240/120 V, 1 ph	-	-	12.3	-	-
Step 2	240/120 V, 1 pii					
03 MTR 01	Motor, Duty Pump #1	-	7.5	-	VFD	6
Step 3						
03 MTR 03	Motor, Duty Pump #3 (FUTURE)	-	40	-	VFD	6
	Well Pump (FUTURE)		7.5		FVNR	

B. The Generator shall be suitable for operation with pulse width modulated variable frequency drives (connected as loads as shown on the Plans and operating motors throughout a speed range of 6 to 60 hertz) without detrimental effects on voltage or frequency regulation and stability.

C. MAXIMUM VOLTAGE DIP AND PEAK

Shall not exceed 25 percent.

D. MAXIMUM FREQUENCY DIP AND PEAK

Shall not exceed 10 percent.

E. MAXIMUM STEADY-STATE VOLTAGE OPERATING BAND

Shall not exceed 2 percent.

F. MAXIMUM STEADY-STATE FREQUENCY OPERATING BAND

Shall not exceed 0.5 percent.

G. MAXIMUM VOLTAGE RECOVERY TIME PERIOD

Shall not exceed 5 seconds.

H. MAXIMUM FREQUENCY RECOVERY TIME PERIOD

Shall not exceed 5 seconds.

I. ALTERNATOR OUTPUT WAVEFORM

At no load, harmonic content measured line-to-line or line-to-neutral does not exceed 5 percent total and 3 percent for single harmonics. The telephone influence factor, determined according to NEMA MG 1, does not exceed 50.

J. SUSTAINED SHORT-CIRCUIT CURRENT

For a 3-phase, bolted short circuit at the system output terminals, the system will supply 300 percent of rated full load current for not less than 10 seconds to coordinate circuit breaker tripping. This system shall include over-voltage relay protection to preclude damage to any generator system component.

K. TEMPERATURE RISE OF GENERATOR

Within limits permitted by NEMA MG 1, when operating continuously at full nameplate rating, the temperature rise of the generator shall not exceed 250 degrees F over 100 degrees F ambient.

L. STARTING TIME

The maximum allowable time period to cold start the generator, while operating at the low end of the specified temperature range, and have its

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voltage and frequency sufficiently stable for a transfer switch to accept or automatically initiate a power transfer, shall be 10 seconds.

1.6 SUBMITTALS

For each generator set submit under provisions of Section 01300 and as specified herein.

A. PRODUCT DATA

Provide the manufacturer and a full description of the generator set and associated components. Include features, ratings, and performance including, but not limited to:

- 1. Engine including the following:
 - a. Horsepower at rated speed and load
 - b. Emission Ratings
 - c. Lubrication oil capacity
- 2. Overall dimensions of generator set system including the sub-base fuel tank, and the enclosure.
- 3. Fuel consumption for 1/4, 1/2, 3/4, and full load of generator set
- 4. Electrical governor
- 5. Coolant heater
- 6. Alternator
 - a. Electrical rating (kVA, reactance, time constants, temperature rise, etc.).
- 7. Voltage regulator type, make, model, and wiring diagram
- 8. Noise levels at twenty-three feet (7 meters) in a free field
- 9. Exhaust pipe and muffler sizing backpressure calculations
- 10. Warranty and Service Agreement documentation

- 11. Vibration isolation calculations, Plans and seismic certification from manufacturer per the seismic information listed in Part 1.8B of this Section.
- 12. Bill of Materials
- 13. Wiring Diagram

B. QUALITY ASSURANCE

Provide documentation showing all CD&Es (compliances, deviations, and exceptions) for this Specification.

C. GENERATOR SIZING CALCULATIONS

Submit calculations showing that the submitted generator's standby power output rating is capable of meeting the specified loads in the specified steps listed. The calculations shall show that the generator meets the specified performance requirements.

D. OPERATION AND MAINTENANCE MANUAL

1. Field Test Reports

Indicate and interpret test results for compliance with manufacturer's published standards for unit provided. Provide written approval of installation in accordance with all manufacturers' recommendations.

2. Operation and Maintenance Data

Provide information to be included in the operation and maintenance equipment manuals specified in Section 01300, Section 11000, and as specified herein.

3. Test Reports

The O&M manual shall include a copy of the factory test data and the field test report.

4. Service Agreement and Warranty

Include copies of the Service Agreement and Warranty in the Operation and Maintenance Manual.

1.7 **QUALITY ASSURANCE**

See Section 16050.

SOURCE LIMITATIONS A.

- 1. Obtain engine generator set from a single supplier with responsibility for the complete system. Furnish a new product built from components with proven reliability and compatibility. The generator set shall be coordinated to operate as a unit as evidenced by records of prototype testing by the OEM.
- 2. The warranty shall be supported by the original distributor, not offset to an engine manufacturer, an alternator manufacturer, or a new manufacturer's distributer.

PRODUCT SELECTION FOR RESTRICTED SPACE B.

The site and building are designed around the approved generator sets. This includes sizing of fuel tanks, proper airflow, NEC clearance requirements, and access space. The Contractor, in concurrence with the Engineer, shall make all changes necessary required to meet the design requirements when submitting on an alternate generator at no additional cost to the Owner.

- C. Generator set to be UL 2200 listed "Stationary Engine Generator Assemblies."
- D. All specified generator accessories.

E. **EMISSIONS**

EPA certified for all current EPA emissions requirements.

F. **FACTORY TEST**

Test assembled generator set at the factory prior to shipment to the job site. The power factor for the factory test shall be at 0.8 p.f.

1. Show the following conditions at load and no load on the Generator Set: Charging System Volts, Voltage Output, Frequency, Coolant Temperature, and Oil Pressure, and other pertinent information on the test report. Provide a plot of the transient voltage and a plot of the frequency response versus time as a result of a full load single step.

- 2. Perform manufacturer's standard factory tests.
- 3. Test for a minimum of 30 minutes at full load per NFPA 110.

G. REGULATORY REQUIREMENTS

- 1. The NEC defines the following items:
 - a. Article 700 EMERGENCY SYSTEMS
 - b. Article 701 LEGALLY REQUIRED STANDBY SYSTEMS
 - c. Article 702 OPTIONAL STANDBY SYSTEMS
- 2. For this project the installation shall meet all requirements of an NEC 702 system. Generator shall be provided with all options and features required for installation as part of this system.

1.8 PROJECT/SITE CONDITIONS

A. ENVIRONMENTAL REQUIREMENTS

Engine generator system is designed, engineered, and rated to withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

- 1. Ambient Temperature: Minus 5 degrees F to 122 degrees F.
- 2. Relative Humidity: 0 to 95 percent.
- 3. Elevation: Sea level to 500 feet.

B. SEISMIC REQUIREMENTS

The entire generator package including all mounted accessories shall comply with the requirements of the latest editions of 2021 IBC and of ASCE 7-16 Minimum Design Loads for Building and Other Structures, Chapter 13 "Seismic Design Requirements for Nonstructural Components," as referenced and amended by the IBC. Seismic design parameters are as follows:

1. Risk Category IV, Seismic Design Category D.

- 2. Component Importance Factor: Ip = 1.5.
- 3. Design response acceleration parameters:
 - a. $S_{DS} = 1.2g$.
 - b. $S_{D1} = 0.537g$.

1.9 WARRANTY AND MAINTENANCE

A. WARRANTY

- 1. The manufacturer shall warrant the materials and workmanship of the generator set for a minimum of 5 years, or 2,500 hours from the registered commissioning and startup.
- 2. The warranty shall be comprehensive and shall include all components included in the generator package. No deductibles shall be allowed for travel time, service hours, repair part costs, etc., during the warranty period.

B. 2-YEAR MAINTENANCE SERVICE

Beginning at time of Substantial Completion, provide 24 months full maintenance service performed by qualified service technicians of the manufacturer's designated service organization. Include quarterly inspections to check for defects and operational abnormalities. Include routine preventive maintenance (oil changes, filter changes, belt adjustments, etc.) as recommended by the manufacturer and perform adjustments as required to bring the generator performance back into compliance with the original specifications. Provide OEM parts and supplies to complete all service to support all factory warranty requirements with written reports to the Owner upon completion of visits. No deductibles shall be allowed for travel time, service hours, repair part costs, etc., during the warranty period.

Provide a 2-hour load bank test on the generator at 11 months and 23 months from the time of Substantial Completion.

1.10 EXTRA MATERIALS

Reference Specification Section 16050 for spare parts.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. APPROVED MANUFACTURERS

1. Kohler as provided by Power Systems West.

No other manufacturers, and/or distributors shall be considered for this project.

2.2 ENGINE

A. FEATURES

- 1. The engine shall be specifically designed for use with the specified fuel type.
- 2. Engine speed shall be governed by an electronic governor. Refer to frequency requirements specified earlier in this Specification.

B. COMPONENTS

1. Oil Pump

Gear type lubricating oil pump for supplying oil under pressure to main bearings, crankpin bearings, pistons, piston pins, timing gears, camshaft bearings, and valve rocker mechanism.

2. Oil Filters

Full flow oil filters conveniently located for servicing, with a spring-loaded bypass valve to ensure oil circulation.

3. Air Filter

Dry type air filter.

4. Cooling System

Sufficient to cool the engine when the generator set is delivering full rated load in an ambient temperature of 104 degrees F.

- a. Engine-driven, centrifugal-type water circulating pump.
- b. Thermostatic valve.
- 5. Coolant/Jacket/ Block Heater

As described in Part 2.6-B of this Section.

6. Electrical starters sufficient to start the engine within 10 seconds of call to start.

7. Batteries

Lead acid batteries shall be of sufficient capacity to permit starting the generator engine a minimum of four times without recharging. Batteries are to be mounted in an earthquake- and drip-proof rack on the skid, frame, or other approved separate location with required connections provided.

8. Battery Heater

As described in Part 2.6-B of this Section.

9. Battery Charger

- a. Silicone rectifier static type, self-regulated with high current and full float operation with a filtered output.
- b. The charger shall be capable of providing a 10 A DC high current charging rate when the battery voltage is below the "float voltage set point." Full floating charging when voltage is above the set point.
- c. Battery charger operates from 120 volts, single phase AC connected to Generator Auxiliary Device Panel (GADP) as per Section 2.6.A.
- d. The charger shall be complete with voltmeter, ammeter, charging rheostat, automatic equalizing timer, and high/low battery voltage alarm.
- e. The battery charger shall be factory mounted with vibration isolators to prolong service life.

- f. Battery charger shall include standard NFPA outputs where generator is legally required for life safety.
- 10. Provide watertight flex connections for all conduits and piping attached to generator.
- 11. LPG Vaporizer
- 12. Dry Fuel Filter

2.3 ALTERNATOR

- A. Four pole, 1,800 rpm revolving field generator.
- B. Enclosure shall be of drip-proof construction.
- C. Insulation Class H.
- D. Wiring shall be 12-lead, reconnectable, and configured for the specified voltage, phasing, neutral point, and frequency.
- E. ALTERNATOR HEATER

As described in Part 2.6-B of this Section.

2.4 VOLTAGE REGULATOR

An electronic voltage regulator shall be provided.

2.5 CONTROL PANEL

The Control panel shall be of the rotatable dead-front type, vibration free mounted on the generator set. The generator control panel and the generator main circuit breaker shall be installed per NEC clearances and provide accessibility to equipment. The tops of control panels and the circuit breakers shall be mounted a maximum of 72 inches above the finished floor.

A. The control panel shall operate at 12 or 24 VDC from the generator/battery electrical system as required by manufacturer based on the size of the system.

- B. Control panel shall include the following functions/devices:
 - 1. Automatic Starting System
 - a. Provides three 15 second cranking cycles and two rest periods followed by a lockout and alarm.
 - b. Operation is initiated by the closing of a remote Form A contact in the automatic transfer switch control circuit.
 - 2. Indicating light for alarm condition.
 - 3. Indication for the following:
 - a. Running
 - b. Low coolant level
 - c. High coolant temperature
 - d. Low oil pressure
 - e. Over speed
 - f. Over crank
 - g. AC volts for each phase
 - h. AC current for each phase
 - i. Frequency
 - j. Lube oil pressure
 - k. Coolant temperature
 - 1. Run Time
 - m. Number of Starts
 - 4. Engine "AUTO-OFF-MANUAL" control selector switch.
 - 5. Red colored emergency shutdown pushbutton/switch.

- 6. Time delay relay to permit operation at "NO-LOAD" after retransfer of load to normal source (cool down timer).
- 7. Automatic safety controls which shut down the engine on:
 - a. Low lubricating oil pressure
 - b. Low coolant level
 - c. High jacket water temperature
 - d. Engine over speed
- 8. Include a Form A (N.O. Dry) contact for remote connection for each of the following Generator functions.
 - a. Running
 - b. General Alarm
 - c. Fail (shall include, as a minimum, any combination of conditions in 8 above)
 - d. AUTO-OFF-MANUAL control switch in Auto Mode
 - e. Low Battery Voltage
 - f. Low Oil Pressure
 - g. High Coolant Temperature
 - h. Low Fuel Level
 - i. High Fuel Level or Pressure
- 9. Control Cabinet Heater

As described in Part 2.6-B of this Section.

2.6 ACCESSORIES

A. GENERATOR AUXILIARY DEVICE PANEL

The generator manufacturer shall provide, install, and prewire a Generator Auxiliary Device Panel (GADP) as part of the generator system with the following minimum features:

1. The GADP shall consist of a NEMA 1 gasketed 240/120 VAC single phase load center with a main breaker and appropriately sized branch circuit breakers for the battery charger and the heaters listed below under GENERATOR HEATERS. Available power to the panel may be 240/120 VAC or 208/120 VAC, single phase.

Exception:

The GADP load center can be replaced with one or more 20 A, 4-plex receptacle sets in cast aluminum boxes under the following conditions:

- a. The battery charger and all heater loads are 120 VAC, single phase,
- b. The sum of the battery charger and all heater loads does not exceed 1920 VA (16 A),
- c. All loads are prewired by the manufacturer with grounded plug cables,
- d. The receptacles are placed within reach of all load plugs,
- e. If required, multiple 4-plex receptacle sets are connected together by the manufacturer (provide a single electrical connection point for the Contractor).
- 2. For outdoor generators, the GADP shall be securely mounted within the enclosure in a location easily accessible by the operator and to a Contractor-provided power conduit.
- 3. The GADP shall be internally connected to the described loads by the generator manufacturer.
- 4. It is the intent that the Contractor need only provide a single power conduit and associated conductors to the manufacturer-provided GADP and terminate the conductors to a main circuit breaker,

neutral, and ground. All connections for heater controls and devices shall be prewired and pretested by the manufacturer.

B. GENERATOR HEATERS

1. Coolant Heater

Engine mounted, thermostatically controlled immersion type engine coolant heater to ensure a minimum coolant temperature of 120 degrees F at ambient room temperature of 5 degrees F. Provide as shown in the table below.

Provide the following generator set heaters:

	Voltage	Wattage
Device	Configuration	(W)
Coolant Heater	208V 1ph or 120V	~1500

C. CIRCUIT BREAKERS

- 1. Provide an output main circuit breaker according to the plans and specifications section 16410. This breaker shall be lockable in its open position. The breaker shall have an auxiliary contact that is open when the breaker is in the open position. This circuit shall be prewired by the generator manufacturer to dedicated terminals in the generator control panel. Wire between these devices in LFMC conduit.
- 2. Provide a generator field protection circuit breaker, or other means to protect the alternator.
- 3. Provide a load bank circuit breaker according to the plans and that meets specification section 16410.

D. EMERGENCY STOP

The emergency disconnecting means shall:

- 1. Disable all prime mover start control circuits.
- 2. Initiate a shutdown requiring a mechanical reset.
- 3. Be lockable in the open/disabled position.
- 4. Be readily accessible.

5. Be clearly labeled "EMERGENCY GENERATOR SHUTDOWN" in an attention getting color.

E. DECALS, PLACARDS, AND SIGNS

- 1. The generator manufacturer shall provide all decals and signage as required by the regulatory and/or inspecting agency for the particular installation, including, but not limited to the following:
 - a. One hazardous material placard, diamond shape, 4 color (red, white, blue, yellow) with numbers 240 (Propane) in accordance with NFPA 704.
- 2. The Contractor shall provide the following in an easily viewable location on the fuel tank unless noted otherwise:
 - a. One 3" x 12" decal labeled "Propane" (black/white).

F. ANCHORS

Anchors used to secure the generator to the base or other stable surface shall be designed and sized by the manufacturer. Anchors shall be cast-in-place 316 stainless steel anchor bolts or drilled-in 316 stainless steel anchors set with epoxy adhesive. Expansion type anchors shall not be acceptable. The Contractor shall provide and install these anchors.

2.7 EXHAUST SYSTEM

- A. Sufficiently sized to ensure against loss of power due to excessive backpressure in accordance with engine manufacturer's recommendations. Include a drain plug and drip leg in low point of exhaust piping to protect engine. Terminate exhaust piping with a rain cap.
- B. The exhaust systems shall be mounted inside the enclosure.

C. FLEX CONNECTION

Provide a stainless-steel flexible exhaust connector, with an exhaust temperature test fitting, flanged for service disconnection.

D. SILENCER

Provide a critical grade silencer. Silencer construction shall be steel with high temperature paint or aluminized finish.

Mason County PUD No. 1
Manzanita Reservoir and Booster Pump Station
G&O #22260 16230-19 – Generator Assemblies

2.8 ENCLOSURE

A. ACOUSTICAL ENCLOSURE

The Generator [03 GEN 01] shall be provided with a skintight acoustical weather protective enclosure.

- 1. The enclosure shall reduce the sound pressure level of the generator set while operating at full rated load to an average of 65 dBA at any location 23 feet (7 meters) from the generator set in a free field environment.
- 2. The enclosure shall have hinged access doors to maintain easy access for all operating and service functions. All hardware and hinges shall be stainless steel. All doors shall be lockable and include retainers to hold the door open during servicing. The roof shall be cambered to prevent the accumulation of water. The roof and walls shall be designed to withstand snow and wind loads per the IBC.
- 3. All sheet metal shall be primed for corrosion protection and finish painted with a color chosen by the Owner from the manufacturer's standard options.
- 4. The air intake and exhausts shall be sized to provide ample airflow for the generator set operation at rated load in ambient temperature of 100 degrees F.

2.9 FINISH

The entire standby generator set assembly with accessories is to be factory painted, color chosen by Owner from manufacturer's standard colors. Generator set manufacturer shall provide appropriate epoxy/polyurethane coating system for high heat conditions.

PART 3 EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

Deliver engine generator set and system components to their final locations in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is safe from such hazards. Field repair of material or

equipment made defective by improper storage or site construction damage by other trades may be cause for rejection of installation.

3.2 INSTALLATION

- A. Install the complete generator set and accessories per the manufacturer's installation instructions.
 - 1. Anchor the generator set to concrete housekeeping base or pad with high strength anchors and adequate penetration suitable for the Seismic Design Category as specified in the Plans.
 - 2. Make all electrical connections between accessory items, which are not factory wired, prior to requesting the test engineer.
- B. Maintain minimum workspace around unit and components per manufacturer's installation shop plans and NFPA 70 NEC.
- C. Provide a complete fill of lubricating oil.
- D. Provide a complete fill of propane fuel in remote storage tank before testing.
- E. Provide a complete fill of manufacturer approved antifreeze (ethylene-glycol) and water to protect the engine and heat exchanger cooling system to minus 25 degrees F.
- F. Contractor shall locate generator control panel and the generator main circuit breaker per NEC clearances and provide accessibility to equipment. Neither shall be mounted more than 72 inches above the floor. Include all costs associated with relocating the standard control/service panel arrangement on generator set to maintain code requirements in the Bid Cost.
- G. The generator set shall not be started up or tested in the field until all exhaust piping has been insulated as specified and shown on the Plans. All intake and exhaust louvers and fuel system components shall be fully functional.
- H. The emergency stop may be located remotely from the generator in a readily accessible location, or may be installed on the exterior of the generator enclosure. It shall not be installed within the generator enclosure, nor shall it be installed within the generator equipment room.

3.3 IDENTIFICATION

Identify field installed wiring, components, and provide warning signs as specified in Section 16050.

3.4 GROUNDING

Provide ground continuity to facility electrical ground system as indicated in the Plans and Specification 16060.

3.5 FIELD QUALITY CONTROL

A. Provide services of a factory authorized service representative to provide inspection results of field visit and field testing in writing.

B. TESTING AGENCY

Provide the services of a qualified independent testing agency to perform specified field quality-control testing.

C. TESTING

1. Prior to Energization

After installing disconnect switches and circuit breakers, perform visual and mechanical inspection of enclosure and devices.

2. Provide third party breakers testing per Specification 16050, Section 3.

Check connections and mounting for proper torque.

Correct or replace malfunctioning units and retest.

Remove any burrs, filings, or other foreign materials from enclosure. Completely wipe down and vacuum enclosure.

3. After Energization

After electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

Correct malfunctioning units on site where possible and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

D. FIELD TEST

Test the assembled generator set after installation at the job site is complete.

- 1. Advise the Engineer, the Integrator, the Contractor, the local Fire Prevention Inspector, and the Owner of the proposed time and date of the field test at least 2 weeks in advance so that the test may be witnessed if desired.
- 2. Under supervision of a factory authorized service representative, pretest all system functions, operations, and protective features. Provide all instruments and equipment required for tests. Adjust to ensure operation is according to specifications.
- 3. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations and these specifications under the environmental conditions present and expected.
- 4. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include, but not be limited to: all electric heaters, battery charger(s), etc.

5. Cold Start Test

- a. The unit shall demonstrate the ability to start from a "cold" standby condition (i.e., normal standby mode with engine coolant temperature established by properly functioning water-jacket heater).
- 6. Calibration and PLC Signal Status Check
 - a. Calibrate all sensors and instruments.
 - b. Verify the scaling and connections of each signal to the terminal strip identified in the plans.
- 7. Generator Load Testing
- 8. Generator load testing shall be provided using a manufacturer-provided temporary load bank at 1.0 power factor. The generator shall be operated at 50 percent of full load rating for thirty minutes, followed seamlessly by thirty minutes at 80 percent of full load

rating, followed seamlessly by one hour at 100 percent full load rating.

- 9. After the first 15 minutes at full load, the following shall be recorded at 15-minute intervals (four recordings).
 - a. Voltage (phase to phase and phase to ground) and phase rotation
 - b. Amperage (each phase)
 - c. Frequency
 - d. Fuel pressure, oil pressure, and water temperature
 - e. Exhaust gas temperature at engine exhaust outlet
 - f. Ambient temperature

During the load test period, check for exhaust leaks, path of exhaust gases outside the building or enclosure, cooling air flow, movement during starting and stopping, vibration during 80 percent and 100 percent loading.

A certified copy of the test results shall be given to the Engineer and supplied with the O&M manuals.

- 10. The Contractor shall demonstrate the backup power system is fully functional by simulating power outages. Provide 14 days written notice.
 - a. Coordinate phase rotation prior to transferring power.
 - b. Power outages shall be simulated to the extent allowed by the process as determined by the Owner. Any process areas or loads not directly associated with the Contractor's scope of work, but connected to the generator being tested, will be turned on/off by the Owner.
 - c. In the event that the installed generator assembly is unable to start and operate the specified loads, at a minimum:
 - i. Document the generator's output voltage current, and frequency during the demonstration including the point of failure.

- ii. Provide written descriptions of the general conditions encountered during the demonstration and any field diagnostic actions performed.
- iii. Document the changes, if any, between the test conditions and the table provided in section 1.5 Performance Requirements
- iv. Provide recommendations to remedy the failed test.
- 11. Refill the remote fuel tank after completion of field testing.

E. RETEST

Correct deficiencies identified by field tests and observations, and retest until specified requirements are fully met.

3.6 TRAINING

- A. The manufacturer of the generator set shall conduct specifically organized training sessions covering operation and maintenance of the unit 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 unit. Training shall include, but not be limited to, the following:
 - 1. Preventative maintenance procedures
 - 2. Trouble-shooting
 - 3. Calibration
 - 4. Testing
 - 5. Replacement of components
 - 6. Automatic mode operation
 - 7. Manual mode operation
 - 8. Fuel and monitoring system
 - 9. Spare parts that have been provided

B. At least one training session, at least 3 hours in duration, shall be conducted at the site after startup of the system. The manufacturer 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.

3.7 FINAL ADJUSTMENTS

- A. Adjust voltage and frequency output of generator set to nominal ratings and mark gauges with plastic pen for normal, operation references for Owner.
- B. Adjust time response of control system to meet site performance requirements.
- C. Check all remote connections again for proper tightness.

3.8 CLEANING

Upon completion of installation and startup, inspect engine generator set. Remove paint splatters, other spots, dirt, and debris. Perform touchup painting to cover scratches and marks to finish. Match original finish of generator set.

*** END OF SECTION ***

SECTION 16410

ENCLOSED SWITCHES, FUSES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of individually mounted switches and circuit breakers used for the following:

- A. Feeder and equipment disconnect switches
- B. Feeder and branch-circuit protection
- C. Motor safety disconnect switches

1.2 RELATED WORKS SPECIFIED ELSEWHERE

Sections	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
16140	Wiring Devices

1.3 SUBMITTALS

Submit under the provisions of Section 01300.

Manufacturer's Product Data for disconnect switches, circuit breakers, and accessories specified in this Section.

Maintenance data for tripping devices to include in the operation and maintenance manual specified in Section 16050.

1.4 QUALITY ASSURANCE

See Section 16050.

Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE MANUFACTURERS

Subject to compliance with requirements, manufacturers offering disconnect switches and circuit breakers that may be incorporated into the work include the following:

- 1. General Electric Co.; Electrical Distribution and Control Division.
- 2. Siemens Energy & Automation, Inc.
- 3. Square D Co.
- 4. Eaton, Cutler Hammer.

2.2 DISCONNECT SWITCHES

A. MOTOR SAFETY DISCONNECT SWITCHES

Motor safety disconnect switches shall be provided when the motor starter is not in sight of the associated motor or when shown on the Plans. Motor safety disconnect switches shall be provided with the following specifications.

- 1. Separately Enclosed Knife Type Switches
 - a. Switches shall not be fused unless specifically shown otherwise on the Plans.
 - b. Switches shall include pad lockable handles, lockable in both the open and closed positions.
 - c. Switches shall be rated at 600 V.

- d. Switches shall include two auxiliary contacts, rated at 10 A at 250 Vac each, connected to the switch pivot arm that are open when the switch is open, closed when the switch is closed.
- e. Switches shall be rated at motor horsepower or as per the Plans, whichever is the larger.

f. Switch enclosures shall be NEMA 4X stainless steel unless specifically stated otherwise in the Plans or through the approval of the Engineer.

2.3 ENCLOSED CIRCUIT BREAKERS

A. ENCLOSED, MOLDED-CASE CIRCUIT BREAKER

NEMA AB 1, with lockable handle in both the open and closed positions.

B. CHARACTERISTICS

Frame size, trip rating, number of poles, and auxiliary devices as indicated on the Plans with interrupting rating to meet available fault current.

- 1. Main and feeder breakers shall be molded case breakers with thermal magnetic trip.
- 2. Motor circuit breakers shall be magnetic only trip with adjustable trip setting.
- 3. Branch circuit breakers shall be molded case, thermal-magnetic trip, trip-free with non-interchangeable, non-adjustable trip unless otherwise noted.

C. APPLICATION LISTING

Appropriate for application, including switching fluorescent lighting loads (SWD) or heating, air-conditioning, and refrigerating equipment (HACR).

D. CIRCUIT BREAKERS, 200 A AND LARGER

- 1. Trip units shall be interchangeable within frame size.
- 2. Assure ability to selectively coordinate circuit breakers.

E. MOLDED-CASE SWITCH

Where indicated, molded-case circuit breaker without trip units.

F. LUGS

Mechanical lugs and power-distribution connectors suitable for copper conductors of the number and size indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install the disconnect switches and circuit breakers level and plumb in locations as indicated, according to manufacturer's written instructions.
- B. Install wiring between disconnect switches, circuit breakers, control, and indication devices.
- C. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and as instructed by manufacturer.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- D. Identify each disconnect switch and circuit breaker according to requirements specified in Section 16050.

3.2 FIELD QUALITY CONTROL

A. TESTING

1. Prior to Energization

After installing disconnect switches and circuit breakers, perform visual and mechanical inspection of enclosure and devices.

Check connections and mounting for proper torque.

Remove any burrs, filings, or other foreign materials from enclosure. Completely wipe down and vacuum enclosure.

2. After Energization

After electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

Correct malfunctioning units on site where possible and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

*** END OF SECTION ***

SECTION 16415

TRANSFER SWITCHES

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of the following types of power transfer switches:

A. Automatic Transfer Switches.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01600	Materials and Equipment
01800	Testing, Commissioning, and Training
02300	Site Earthwork
Division 3	Concrete
09900	Painting
11000	Equipment General Provisions
Division 15	Mechanical
Division 16	Electrical
16120	Conductors and Cables
16130	Raceway and Boxes

1.3 **DEFINITIONS**

A. 3-POSITION, DELAYED TRANSFER

A 3-position "delayed transfer" ATS can be held in the "center" (no load connection) position for a programmable delayed period of time before completing its transfer to the calling position. Delayed transfer applies to transfers in either direction. Delayed transfers can only apply to "Open Transition" switches.

B. AUTOMATIC TRANSFER SWITCH

Automatic transfer switches shall be defined as power transfer switches used to automatically switch system power away from faulty utility service power to backup generator power then back again to utility power when valid utility power is reacquired.

Automatic transfer switches can be configured for automatic generator starting, waiting for generator stability, then transferring the system bus to the generator. They are also configurable for switching back to utility power under selectable conditions.

Automatic transfer switches can be set up for automatic generator testing and shutdown.

C. CLOSED TRANSITION

A "Closed Transition" ATS provides a "make-before-break" transition when performing automatic generator tests. To make this type of transition, the voltage, frequency, and phase shift between the power sources must be within specified and programmable tolerances. Typical tolerances are $\delta V <= \pm 5$ percent, $\delta f = \pm 0.2$ percent, and the phase shift between ± 5 electrical degrees. This may take from several seconds to several minutes and is only used during system testing where transition delays are not critical. During power failures, the transitions are "breakbefore-make" like an open-transfer switch where time delays are minimal.

D. DELAYED TRANSFER

A "Delayed Transfer" ATS provides a programmable delay in the "neutral position." When in this mode, the load circuit is completely disconnected from both the normal and standby power sources. A delay in this position allows load circuits to dissipate electrical and mechanical energy before being re-energized.

E. NEUTRAL POSITION

The neutral position describes a position of the transfer switch when the load leads are connected to neither the normal nor the standby source. In this position, the load circuit is completely disconnected. This position should not be confused with the neutral bus or with neutral bus switching.

F. NEUTRAL SWITCHING

In a neutral-switching ATS, the neutral load bus is switched between power source neutrals in the same manner as the power leads.

G. NORMAL POSITION

A switch is in its "NORMAL" position when it is connected to the primary (utility) power source.

H. OPEN TRANSITION

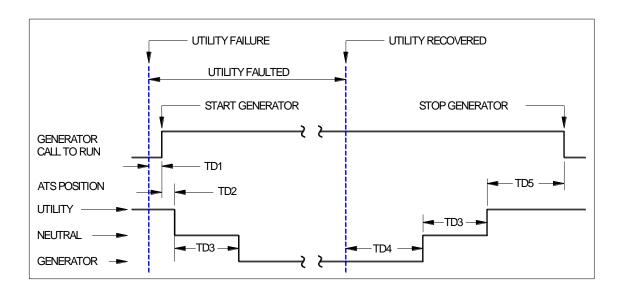
An "Open Transition" ATS provides a "break-before-make" transition under all transition conditions.

I. STANDBY POSITION

A switch is in its "STANDBY" position when it is connected to the secondary (generator) power source. This position may also be referred to as the back-up position.

J. TIME DELAY DEFINITIONS

- TD1 "Call Delay" is the delay from the ATS sensing faulty utility power and the issue of a generator call to run command.
- TD2 "Off Utility Delay" is the delay from the ATS issuing a generator call to run command and the transfer of the ATS away from the "UTILITY" position.
- TD3 "Hold Neutral Delay" is the period of time that the ATS will hold the switch in its "neutral" (or "center" or "disconnected") position when transferring from the "UTILITY" position to the "GENERATOR" position and from the "GENERATOR" back to the "UTILITY" position. In this neutral position, the load side of the ATS is disconnected from both utility and generator power. This delay allows the electronic equipment ample time to dissipate their residual power for proper reapplication of power flowing a shutdown. This delay only applies to 3-position delayed-transfer switches.
- TD4 "Hold Generator Delay" is the delay of the ATS to switch back to utility power after the utility has been sensed as healthy.
- TD5 "Cool-Down Delay" is the duration of generator runtime after the ATS has switched back to utility. This cool down period is intended to shut the generator off only after a relaxed cooling period.



3-POSITION SWITCH SIMPLIFIED TIMING DIAGRAM

K. UVTL

Utility Voltage Transition Level.

L. GVTL

Generator Voltage Transition Level.

1.4 SUBMITTALS

Submit four copies of the following:

- A. Manufacturer's Product Data for transfer switches and accessories specified in this Section.
- B. Manufacturer's Product Data for trapped-key interlocks and accessories specified in this Section, and documentation of compatibility with hardware specified under other Sections.
- C. O&M Manual requirements are outlined in Section 01300 and shall also contain the following information:

- 1. Two-year maintenance service agreement as described below.
- 2. Screenshots and descriptions detailing how to step through the setup and configuration menus.
- 3. Field test results as described herein.

1.5 MAINTENANCE

A. ATS

Beginning at the time of Substantial Completion, provide a 24 months full maintenance service performed by skilled employees of the manufacturer's designated service organization. Provide OEM parts and supplies to complete all service to support all factory warranty requirements with written reports to the Owner upon completion of visits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

Subject to compliance with requirements, provide products by the following:

A. TRANSFER SWITCHES

All automatic transfer switches shall be compatible with the selected genset.

- 1. General Electric Co.; Electrical Distribution & Control Div.
- 2. Eaton, Cutler-Hammer.
- 3. ASCO
- 4. Kohler
- 5. Cummins Power Generation/Onan
- 6. Square D
- 7. MTU

2.2 PROCUREMENT

- A. The party responsible for the procurement of the automatic transfer switch shall be the single source of responsibility for submittal, products provided, warranty, startup and service purposes.
- B. All automatic transfer switches shall be provided by the contractor that is supplying the generator set as defined in Specification 16230.

C. The generator and automatic transfer switches may be of different manufacturers.

2.3 AUTOMATIC TRANSFER SWITCHES

A. RATINGS

- 1. Phases: As shown on the Plans.
- 2. Poles: As shown on the Plans.
- 3. Voltage Rating: As shown on the Plans.
- 4. Current Rating: As shown on the Plans.
- 5. Fault Current Rating: As shown on the Plans.
- 6. Neutral: With neutral bus unless indicated otherwise on the Plans.
- 7. Enclosure: As shown on the Plans.
- 8. SUSE rated utility disconnect breaker: As Shown on the Plans

B. FEATURES

Reference "DEFINITIONS" in this specification.

- 1. UL 1008/CSA certification.
- 2. Open Transition
- 3. Delayed transfer (3-position) switch, capable of transferring the connected load from its "normal" power source to a "neutral" (disconnected) position for a programmable period of time, then from the "neutral" position to its "standby" power source, and capable of retransferring back to its "normal" power source with mirrored positions and delays.

Delay settings:

Setting	Timing Function ⁽¹⁾	Initial Duration
TD1	Call Delay	1 second
TD2	Off Utility Delay	0 seconds
TD3	Hold Neutral Delay	30 seconds
TD4	Hold Generator Delay	30 minutes
TD5	Cool-Down Delay	5 minutes

- (1) Reference "Time Delay Definitions"
- 4. Power switching shall be provided for all phases.
- 5. Power sensing shall be provided for all phases.
- 6. Switch transfer control sensing shall be provided on all phases.
- 7. Switching mechanism shall be a discrete purpose device specifically designed for Automatic Transfer Switches.
- 8. Electrically operated by solenoid mechanisms and held by mechanical latches.
- 9. High current-breaking capacity with silver-surfaced contacts equipped with arc barriers and magnetic blow-out coils.
- 10. Contacts rated in accordance with UL 1008 for current carrying and switching capabilities.
- 11. Suitable for repetitive load transfer switching. Minimum 1,000 transfer cycles under full load conditions and minimum 2,000 cycles under no load conditions.
- 12. Interlocked to prevent supplying the load from more than one source at a time.

- 13. Adjustable close differential voltage monitoring relays provided on all three phases to sense voltage on the "NORMAL" and "STANDBY" sources.
- 14. Auxiliary Contacts
 - a. All auxiliary contacts shall be isolated, dry, Form C, suitable for 120V, 10A inductive loads, NEMA B10 rated, wired to easily-accessible terminals in the low voltage control area.

- b. Provide, as a minimum, the following status outputs:
 - i. Switch in utility power position.
 - ii. Switch in generator position.
 - iii. Switch fault.
 - iv. Generator call status. This status signal is one of two identical outputs. One can be directly connected to the generator to call a start operation. The second is electrically isolated from the generator connection and intended for connection to monitoring equipment.
- 15. Molded case service entrance disconnect breaker.
- 16. Intelligent display panel with push-button navigation switches.

 The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120 degrees. The display panel shall be capable of providing the following functions and capabilities:
 - a. Display source condition information, including AC voltage for each phase of normal source. Voltage for all three phases shall be displayed on a single screen for easy viewing of voltage balance. Line to neutral voltages shall be displayed for 4-wire systems.
 - b. Display source status, to indicate source is connected or not connected.
 - c. Display load data, including 3-phase AC voltage, 3-phase, frequency, kW, and kVA. Voltage and current data for all phases shall be displayed on a single screen.
 - d. The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:
 - i. Set nominal voltage and frequency for the transfer switch.

- ii. Adjust voltage and frequency sensor operation set points.
- iii. Set up time clock functions.
- iv. Set up load sequence functions.
- v. Enable or disable control functions in the transfer switch, including program transition.
- vi. Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.
- e. Display real time clock data, including date, and time in hours, minutes, and seconds. The real time clock shall incorporate provisions for automatic daylight saving time and leap year adjustments. The control shall also log total operating hours for the control system.
- f. Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source. Display number of times transferred, and total number of times each source has failed.
- g. Display information for other transfer switches in the system, including transfer switch name, real time load in kW on the transfer switch, current source condition, and current operating mode.
- h. Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, battery charger malfunction, network battery voltage low, and network communications error.

C. OPERATION

- 1. When "normal" voltage falls below invalid UVTL, then
 - a. The ATS starts the generator.

- 2. When the "standby" voltage is above valid GVTL, then
 - a. After a programmable delay in the "normal" position, the switch transfers from the "normal" position to the "neutral" position.
 - b. After a programmable delay in the "neutral" position, the switch transfers from the "neutral" position to the "standby" position.
- 3. When "normal" voltage is above valid UVTL, then
 - a. After a programmable delay in the "standby" position, the switch transfers from the "standby" position to the "neutral" position.
 - b. After a programmable delay in the "neutral" position, the switch transfers from the "neutral" position to the "normal" position.
 - c. After the switch returns to the "normal" position, the transfer switch shuts off the generator after a programmable cool down delay.
- 4. Two separately adjustable time delays prevent transfer and retransfer on voltage dips.
- 5. Seven-day exercise timer provides periodic exercising of generator.
 - a. Timer is programmable as to day of week, time of day, and duration for exercising.
 - b. Programmable as to whether generator is exercised with or without load being transferred
- 6. Initially preset the UVTL at:
 - a. Valid >= 90 percent nominal system voltage
 - b. Invalid <= 80 percent nominal system voltage
 - c. Relay will pull in at the "valid" level and drop out at the "invalid" level.

7. Initially preset the GVTL at:

- a. Valid >= 90 percent nominal system voltage
- b. Invalid <= 75 percent nominal system voltage
- c. Relay will pull in at the "valid" level and drop out at the "invalid" level.
- 8. Initially preset the utility and generator frequency transition levels at:
 - a. Valid >= 95 percent of system frequency
 - b. Invalid >= 90 percent of system frequency

PART 3 EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

Deliver transfer switch components to their final locations in protective wrappings, containers, and other means of protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is safe from such hazards. Field repair of material or equipment made defective by improper storage or site construction damage by other trades may be cause for rejection of installation.

3.2 INSTALLATION

- A. Install transfer switch per the manufacturer's installation instructions.
- B. Maintain minimum workspace around unit and components per manufacturer's installation shop drawings and NFPA 70 NEC.

3.3 IDENTIFICATION

Identify field-installed wiring, components, and provide warning signs as specified in Section 16050.

3.4 GROUNDING

Provide ground continuity to facility electrical ground system as indicated in the Contract Provisions.

3.5 FIELD QUALITY CONTROL

A. ADJUSTING AND PRETESTING

Pretest all system functions, operations, and protective features. Provide all instruments and equipment required for testing. Adjust the time delays, and trip point settings to ensure operation is within accordance to the specifications.

B. FIELD TEST

Test the transfer switch after installation is complete.

- 1. Advise the Engineer of the test date well in advance so that the test may be witnessed if desired.
- 2. Perform manufacturer's standard field tests.
- 3. Provide documented field test results to Owner and Engineer.
- 4. Provide trip set points and time delays in the O&M manual.

*** END OF SECTION ***

SECTION 16440

PANELBOARDS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of lighting, power, and distribution panelboards, and associated auxiliary equipment rated 600 V and less.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
16060	Grounding and Bonding

1.3 SUBMITTALS

Submit under the provisions of Section 01300.

A. PRODUCT DATA

For each type of panelboard, accessory item, and component specified.

B. SHOP DRAWINGS

For panelboards. Include dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:

- 1. Enclosure type and mounting.
- 2. Bus configuration and current ratings.
- 3. Short-circuit current rating of panelboard.
- 4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

C. PANELBOARD SCHEDULES

For installation in panelboards and inclusion in the maintenance manuals specified in Division 1. Submit final versions prior to closeout of project.

D. MAINTENANCE DATA

For panelboard components to include in the maintenance manuals specified in Division 1. Include manufacturer's written instructions for testing circuit breakers.

1.4 QUALITY ASSURANCE

See Section 16050.

Subject to compliance with requirements, provide products by the following:

A. REFERENCED STANDARDS

- 1. National Electrical Manufacturers Association (NEMA):
 - a. NEMA 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. NEMA PB 1, Panelboards.
- 2. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
- 3. Underwriters Laboratories, Inc. (UL):
 - a. 50, Standard for Safety Cabinets and Boxes.
 - b. 67, Standard for Safety Panelboards.

1.5 EXTRA MATERIALS

Reference Specification Section 16050 for spare parts.

All panelboards associated with a project shall be the same manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. MANUFACTURERS

Subject to compliance with requirements, provide products by the following:

- 1. General Electric Co.; Electrical Distribution & Control Div.
- 2. Eaton, Cutler-Hammer.
- 3. Siemens Energy & Automation, Inc.
- 4. Square D Co.

2.2 PANELBOARD FABRICATION

A. MANUFACTURED UNITS

Standards: NEMA PB 1, NFPA 70, UL 50, UL 67.

B. RATINGS

- 1. Bus current, voltage, number of phases, and number of wires as shown on the Plans.
- 2. Short Circuit Fault Rating
 - a. 250 Vac or Less

10 kAIC minimum short circuit rating or as indicated on the Plans, whichever is the greater.

b. 600 Vac or Less

14 kAIC minimum short circuit rating or as indicated on the Plans, whichever is the greater.

3. Service Entry Equipment rated when indicated on the Plans.

C. BUS BARS

1. Main Bus Bars

- a. Plated drawn copper of 98 percent conductivity sized to limit temperature rise to a maximum of 65 degrees C above an ambient temperature of 40 degrees C.
- b. Drilled and tapped and arranged for sequence phasing of the branch circuit devices.

2. Ground Bus

- a. Ground bus shall be full size (100 percent) rated unless shown otherwise on the Plans.
- b. Ground bus shall be bonded to the box.
- c. Provide additional isolated ground bus when indicated on the Plans.
- d. Compression type connectors.

3. Neutral Bus Bars

- a. Insulated, full size (100 percent) rated unless shown otherwise on the Plans.
- b. Compression type connectors.

D. CONSTRUCTION

1. Interiors shall be factory assembled and designed such that switching and protective devices can be replaced without disturbing adjacent unit and without removing the main bus connectors.

2. Main Lugs

a. Compression type approved for copper and aluminum.

E. ENCLOSURES

1. Boxes

a. Code gauge galvanized steel, furnished without knockouts.

2. Trim Assembly

a. Code gauge galvanized steel, finished with rust-inhibited primer and manufacturer's standard paint inside and out.

3. Distribution, Lighting and Appliance Panelboard

- a. Trims supplied with hinged door over all circuit breaker handles.
- b. Trims for surface mounted panelboards shall be the same size as the box.
- c. Trims for flush mounted panelboards shall overlap the box by 3/4 inch on all sides.
- d. Doors on panelboard front, with concealed hinges, secured with corrosion resistant chrome-plated flush catch and tumbler lock, all keyed alike.
- e. Nominal 20-inch wide by 5-3/4-inch deep with gutter space in accordance with NEC.
- f. Clear plastic cover for directory card on the inside of each door.

g. Enclosure

i. Indoor Wet Locations: NEMA 12 unless stated otherwise on the Plans.

4. Power Distribution Panelboard

- a. Trims cover all live parts with switching device handles accessible.
- b. Less than or equal to 12-inches deep with gutter space in accordance with NEC.

- c. Doors on panelboard front, with concealed hinges, secured with corrosion resistant chrome-plated flush catch and tumbler lock, all keyed alike.
- d. Clear plastic cover for directory card on the inside of each door
- e. Enclosure
 - i. Indoor Wet Locations: NEMA 12 unless stated otherwise on the Plans.

F. SERVICE EQUIPMENT APPROVAL

Listed for use as service equipment for panelboards with main service disconnect.

1. Future Devices

Equip with mounting brackets, bus connections, and necessary appurtenances, for the overcurrent protective device ampere ratings indicated for future installation of devices.

2.3 OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES

- A. MAIN OVERCURRENT PROTECTIVE DEVICE
 - 1. Molded-Case Circuit Breaker, NEMA AB 1, handle lockable.
 - 2. Vertical mounting unless stated otherwise in the Plans.

B. BRANCH OVERCURRENT PROTECTIVE DEVICES

- 1. Shall be bolt-on molded case circuit breakers
- 2. The minimum breaker size shall be 15 Amp unless stated otherwise on the Plans.
- 3. Characteristics
 - a. Frame size, trip rating, number of poles, and auxiliary devices as indicated on the Plans.

- b. Fault current rating as defined herein and as indicated on the Plans.
- c. Where branch circuit breakers are shown on the Plans to be GFCI the GFCI shall be Class A (5 mA), sometimes called a "Personal Protection" GFCI.

4. Application Listing

- a. Appropriate for application, including Type SWD for switching fluorescent lighting loads and Type HACR for heating, air-conditioning, and refrigerating equipment.
- 5. Circuit Breakers, 200 A and Larger
 - a. Trip units shall be interchangeable within frame size.
- 6. Circuit breakers, under 200 A
 - a. Thermal-magnetic, trip-free, non-interchangeable, non-adjustable.
- 7. Lugs
 - a. Mechanical lugs and power-distribution connectors for copper conductors of number and size indicated.

PART 3 EXECUTION

3.1 INSTALLATION

Install panelboards and accessory items according to NEMA PB 1.1.

Setup, adjust and fasten in place flush trim and interiors.

Install circuit breakers as shown on the "Panelboard Schedule" for each panelboard. Record all circuit breaker installation deviations from the "Panelboard Schedule" and show on the Record Drawings the actual size and pole position of all circuit breakers installed.

Do not remove knockouts for breaker positions unless a breaker is to be installed (reference EXTRA MATERIALS, UNUSED CIRCUITS in this Section). Where twistouts or knockouts are removed in error, provide a circuit breaker (one pole, 20-ampere) to fill each position removed.

A. MOUNTING HEIGHTS

Top of trim 74 inches above finished floor, unless otherwise indicated.

B. MOUNTING

Plumb and rigid without distortion of box. Mount flush panelboards uniformly flush with wall finish. Provide spacers of neoprene or fiberglass to shim out from irregular surfaces or from damp surfaces.

C. CIRCUIT DIRECTORY

Prepare neatly typewritten panelboards directories in the same pole sequence as the panelboard stamping. Send a copy to the Owner for his records. Prior to typing the final directories, verify room and equipment names and numbers with the Owner and modify circuit descriptions of areas/spaces to conform with the Owner's desires. Obtain approval before installing.

D. PROVISION FOR FUTURE CIRCUITS

Install panelboards in such a manner as to leave access to the box, building chases, knockouts, etc., for future circuit additions. Place conduit in the rear line of knockouts where possible. Install spare conduits from flushmounted panels up to accessible spaces.

E. WIRING IN PANELBOARD GUTTERS

Run neatly parallel and perpendicular to enclosure. Arrange conductors into groups, and bundle and wrap with wire ties.

3.2 IDENTIFICATION

Identify field-installed wiring and components and provide warning signs as specified in Section 16050.

Label each panelboard with engraved laminated-plastic or metal nameplates mounted with corrosion-resistant screws.

3.3 GROUNDING

Connect equipment grounding conductors to ground bus, except for circuits requiring isolated grounding.

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Provide ground continuity to main electrical ground bus as indicated.

3.4 CONNECTIONS

Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Make insulation-resistance tests of each panelboard bus, component, and connecting supply, feeder, and control circuits.
 - 2. Make continuity tests of each circuit.

B. TESTING

1. Prior to Energization

Perform visual and mechanical inspection of panelboard, bus, and breakers.

Check connections and mounting for proper torque.

Remove any burrs, filings, or other foreign materials. Completely wipe down and vacuum panelboard.

2. After Energization

After electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

Correct malfunctioning units on site where possible and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.6 ADJUSTING

Set field-adjustable switches and circuit-breaker trip ranges as indicated.

*** END OF SECTION ***

SECTION 16460

LOW VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of dry-type distribution and specialty transformers rated 1000 V and less.

1.2 RELATED WORKS SPECIFIED ELSWHERE

Section	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods

1.3 SUBMITTALS

Submit under the provisions of Section 01300.

A. PRODUCT DATA

Submit the following:

- 1. Nameplate ratings
- 2. Mounting methods
- 3. Dimensioned plans, sections, elevation views and minimum clearances

B. WIRING DIAGRAMS

Submit manufacturer's wiring diagrams and clearly identify terminals for tap changing and connecting field-installed wiring.

C. FIELD TEST REPORTS

Indicate and interpret test results for tests specified in Part 3.

D. MAINTENANCE DATA

Include in the maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

See Section 16050

1.5 DELIVERY, STORAGE, AND HANDLING

Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit throughout periods during which equipment is not energized and is not in a space that is continuously under normal control of temperature and humidity.

PART 2 PRODUCTS

2.1 MANUFACTURERS

Subject to compliance with requirements, provide transformers by one the following:

- A. Cutler-Hammer/Eaton Corp.
- B. GE Electrical Distribution & Control.
- C. Siemens Energy & Automation, Inc.
- D. Square D; Groupe Schneider.

2.2 TRANSFORMERS, GENERAL

A. DESCRIPTION

Factory-assembled and -tested, air-cooled units of types and sizes specified, designed for 60-Hz service.

B. CORES

Grain-oriented, nonaging silicon steel.

C. COILS

Continuous copper windings without splices, except for taps.

D. INTERNAL COIL CONNECTIONS

Brazed or pressure type.

E. ENCLOSURE

Class complies with NEMA 250 for the environment in which installed.

F. SOUND LEVELS

Manufacturer shall guarantee not to exceed the following:

- 1. Up to 9 kVA: 40 dB.
- 2. 10 to 50 kVA: 45 dB.

G. EFFICIENCY

Ventilated, dry type, 15 kVA and larger: Energy efficient meeting DOE 2016 requirements.

2.3 GENERAL-PURPOSE DISTRIBUTION AND POWER TRANSFORMERS

Comply with NEMA ST 20 and list and label as complying with UL 1561.

A. CORES

One leg per phase.

B. WINDINGS

One coil per phase in primary and secondary.

C. ENCLOSURE

As follows unless otherwise indicated.

1. Indoor, ventilated.

D. INSULATION CLASS

185 or 220 degrees C class for transformers 15 kVA or smaller; 220 degrees C class for transformers larger than 15 kVA.

1. Rated Temperature Rise

150 degrees C maximum rise above 40 degrees C for 220 degrees C class insulation; 115 degrees C maximum rise for 185 degrees C class insulation.

E. TAPS

For transformers 3 kVA and larger, full-capacity taps in high-voltage windings are as follows:

1. Taps, 3 through 25 kVA

Two 5-percent taps below rated high voltage.

F. WALL-MOUNTING BRACKETS

Manufacturer's standard brackets for wall mounted transformers up to 50 kVA.

2.4 CONTROL AND SIGNAL TRANSFORMERS

A. Units comply with NEMA ST 1 and are listed and labeled as complying with UL 506.

B. RATINGS

Continuous duty. If rating is not indicated, provide capacity exceeding peak load by 50 percent minimum.

C. DESCRIPTION

Self-cooled, 2 windings.

2.5 FINISHES

A. INDOOR UNITS

Manufacturer's standard paint over corrosion-resistant pretreatment and primer.

2.6 SOURCE QUALITY CONTROL

Design and routine factory tests comply with referenced standards.

PART 3 EXECUTION

3.1 INSTALLATION

Comply with safety requirements of IEEE C2.

Arrange equipment to provide adequate spacing for access and for circulation of cooling air.

Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.2 GROUNDING

Comply with NFPA 70 requirements for connecting to grounding electrodes and for bonding to metallic piping near the transformer.

Comply with Division 16 Section "Grounding and Bonding" for materials and installation requirements.

3.3 FIELD QUALITY CONTROL

Test to ensure transformer is operational within industry and manufacturer's tolerances, is installed according to the Contract Documents, and is suitable for energizing.

A. TESTS

Include the following minimum inspections and tests according to manufacturer's written instructions.

- 1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
- 2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A and UL 486B.
- 3. Insulation Resistance: Perform megohmmeter tests of primary and secondary winding to winding and winding to ground.

B. TEST FAILURES

Compare test results with specified performance or manufacturer's data. Correct deficiencies identified by tests and retest. Verify that transformers meet specified requirements.

3.4 CLEANING

On completion of installation, inspect components. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars on finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

3.5 ADJUSTING

After installing and cleaning, touch up scratches and mars on finish to match original finish.

Adjust transformer taps to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of facility. Record primary and secondary voltages and tap settings and submit with test results.

*** END OF SECTION ***

SECTION 16510

INTERIOR LUMINAIRES

PART 1 GENERAL

1.1 SCOPE

This work specified in this Section covers interior lighting devices, including luminaires, lamps, and power supplies, along with lighting accessories and controls; as well as luminaire mounting, installation, lamping, and testing.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods

1.3 **DEFINITIONS**

A. BALLAST

The power circuit of a gas-discharge (fluorescent, HID, etc.) lamp. Ballasts are either inductive or electronic.

B. COLOR RENDERING INDEX (CRI)

A figure-of-merit adopted by the Department of Energy that quantifies the color accuracy of lighting devices compared to incandescent light. CRI is normalized such that a score of 100 represents the output of an incandescent lamp.

C. COLOR TEMPERATURE

The color of the light produced by a particular lighting device, measured in kelvin. A higher kelvin temperature results in a "cooler" blue light, while lower kelvin temperatures are "warmer," and more orange.

D. DIFFUSER

A modifier placed in front of a lamp to change the light intensity and distribution. Part of a LUMINAIRE.

E. DRIVER

The power circuit of an LED LAMP. May be part of a luminaire, or integrated into the lamp itself.

F. EMERGENCY LUMINAIRE

A LUMINARE intended to automatically supply illumination to critical areas in the event of failure of the normal supply.

G. ENGINE

See DRIVER in this section.

H. EXIT LIGHT

An illuminated sign or LUMINAIRE intended to indicate the path of egress. An exit light may or may not be an EMERGENCY LUMINAIRE.

I. LAMP

The part of a LUMINAIRE that produces light.

J. LED LAMP

A lamp that uses Light Emitting Diodes (LEDs) to produce useful light. Powered by a DRIVER.

K. LUMEN MAINTENANCE FACTOR

The percent of the rated lumen output of a lamp still available after a specified period of time. A lamp capable of only half of its original output after will have a lumen maintenance factor of 0.50 or **L50**. May be used to specify the performance of a lamp after a particular number of hours, or the number of hours of operation at a particular level.

L. LUMINAIRE

A complete lighting device, exit light, or emergency lighting device. Luminaires consist of one or more LAMPS mounted in a fixture, along with DRIVERS or BALLASTS to power them, and lenses or diffusers to provide the correct lighting distribution.

M. PHOTOCELL

A control device that switches a lighting circuit in response to ambient light level.

1.4 REFERENCES

All applicable ANSI and UL standards.

IES LM-79, LM-80, TM-21.

NFPA 70 [NEC] (latest edition, with Washington State Amendments).

Washington State Energy Code (latest edition).

Washington State Administrative Code [WAC] (current edition).

International Building Code (latest edition, with Washington State Amendments).

1.5 SUBMITTALS

Submit under the provisions of Section 01300.

For each required product, submit data sheets with detailed descriptions of the product to be purchased. Identify each data sheet with the corresponding entry on the Lighting Schedule or Bill of Materials. Where data sheets offer a range of options and accessories, mark or highlight each selection, along with all final part numbers.

- A. Submit on each luminaire in the Lighting Schedule. Submittal shall contain the following information, as a minimum:
 - 1. Manufacturer and part number.
 - 2. Product dimensions and weight.
 - 3. Product environmental rating (NEMA rating).
 - 4. Electrical ratings:
 - a. Voltage, Current, and Power
 - b. Power factor
 - c. Efficacy
 - 5. Lighting metrics:
 - a. Lumen output
 - b. Lumen maintenance factor at 25,000 hours
 - c. Color temperature
 - d. Color Rendering Index (CRI)

- e. Lighting distribution
- 6. Regulatory approvals and certifications, including NRTL listing
- 7. Battery and charging data (if applicable).
- B. Submit on all lighting controls (switches, photocells, occupancy sensors, etc.). Submittal shall contain the following information, as a minimum:
 - 1. Manufacturer and part number.
 - 2. Product dimensions and weight.
 - 3. Environmental rating (NEMA rating).
 - 4. Electrical ratings (Voltage, Current, and Power).
 - 5. Regulatory approvals, certifications, and labels.
 - 6. Wiring diagrams showing both factory- and field-installed wiring for the specific application in this Project. Differentiate between factory- and field-installed wiring.
- C. Submit maintenance data for luminaires and lighting controls in the operation and maintenance manual specified in Section 01300.

1.6 QUALITY ASSURANCE

See Section 16050. Coordinate luminaires, mounting hardware, and trim with all other items to be mounted on the ceiling, and all reserved or classified areas, including work of other trades.

1.7 EXTRA MATERIALS

Reference Specification Section 16050 for spare parts.

1.8 WARRANTY

A. WARRANTY

1. The manufacturer shall warrant the materials and workmanship of all luminaires for a minimum of 2 years from the time of Substantial Completion.

- 2. The warranty shall be comprehensive and shall include all components included in the luminaire package.
- 3. If during the warranty period the manufacturer refuses to honor a claim due to the actions of the contractor, the contractor shall replace all affected items at no cost to the owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:

- 1. Acuity Brands, Inc.; Holophane, Lithonia
- 2. Eaton Corp.
- 3. GE Lighting
- 4. OSRAM Sylvania, Inc.

B. "OR EQUAL" PRODUCTS

Luminaires shall be the products specified in the Lighting Schedule in the Plans, or equal. Substitute products shall:

- 1. Use the same lighting technology (LED, Fluorescent, etc.) as the specified luminaire,
- 2. Have the same lumen output, color temperature, CRI, and IES distribution,
- 3. Not have an input wattage greater than 110% of the specified luminaire, and,
- 4. Have the same environmental ratings.

2.2 LUMINAIRES

A. POWER

- 1. Luminaires shall be powered at the voltage specified in the Lighting Schedule.
- 2. Power supplies, including ballasts, drivers, and transformers, shall be self-contained within luminaires.

B. QUALITY

1. MANUFACTURER LABELS AND MARKINGS

The exterior of lenses and diffusers shall have no visible logos, labels, trademarks, or monograms.

2. METAL PARTS

Metal parts shall be free from burrs, scratches, and sharp corners and edges.

3. TRANSMITTING AND REFLECTING SURFACES

Luminaires shall be provided and installed with all transmitting and reflecting surfaces required to produce the same distribution as the luminaires used as the basis of design, as shown in the Lighting Schedule.

4. FINISH

Provide manufacturer's standard finish, except where otherwise indicated, applied over corrosion-resistant treatment or primer. Finish shall be free from streaks, runs, holidays, stains, blisters, and other defects.

C. MAINTENANCE ACCESS

Any parts of luminaires not subject to the manufacturer's warranty shall be accessible for maintenance and owner-replaceable.

D. UV RADIATION

LED Luminaires shall not emit UV radiation

Luminaires fitted with gas discharge lamps shall block at least 99 percent of the UV radiation emitted by the lamps.

E. WET LOCATION LUMINAIRES

Unless otherwise stated in the Plans, luminaires installed in wet locations shall be rated:

1. NEMA 3R where not subject to splashing or hose-directed water.

Contractor shall provide all materials required to obtain labeled environmental ratings.

F. FUSED LUMINAIRES

Provide fused luminaires for applications:

- 1. Installed more than eight feet above the floor,
- 2. Powered by 277 V circuits, or,
- 3. Where required by code.

Install a listed fuse and fuse holder approved for the application by the luminaire manufacturer.

G. EMERGENCY AND BATTERY BACKED LUMINAIRES

All emergency luminaires shall be UL 924 listed. Additionally, emergency luminaires located in classified areas shall be UL 844 listed.

Emergency luminaires shall have the following features:

1. Self-contained internal battery, rated to provide a minimum of 90 minutes of emergency level illumination in the event of a power failure.

H. EXIT LIGHTS

All exit lights shall be UL 924 listed, and shall have the following features:

- 1. Internal illumination, always on.
- 2. Illuminated arrow indicating direction of egress.

- 3. Self-contained internal battery, rated to provide a minimum of 90 minutes of emergency level illumination in the event of a power failure.
- 4. 120VAC input power unless stated otherwise on the Plans.

2.3 LIGHTING TECHNOLOGIES

Each luminaire shall use the technology specified in the lighting schedule.

A. LED LUMINAIRES

LED Luminaires shall conform to UL 1598 (Luminaires) and UL 8750 (LED Equipment for Use in Lighting Products).

1. Drivers

LED Drivers shall be manufacturer approved for the specific model of luminaire to be installed. Drivers shall meet the following specifications:

- a. UL 8750 listed.
- b. Certified by NRTL acceptable to the State of Washington.
- c. Compliant with FCC Part 15, Class A.
- d. Power Factor: greater than 0.90.
- e. Supply circuit THD: less than 10%.
- f. Temperature Rating: -20 to +40 degrees Celsius.

2. Lamps

LED Lamps shall be an integral part of the luminaire, and rated to last the entire design lifetime of the luminaire. LED lamps shall have the following specifications:

- a. Color Temperature: 4000K, unless otherwise indicated.
- b. CRI: at least 80 CRI.
- c. Lamp Life: at least 60,000 hours, L80.

PART 3 EXECUTION

3.1 INSTALLATION

A. COORDINATION WITH OTHER WORK

- 1. Coordinate lighting with general electrical work, and with other trades.
- 2. Locate luminaires outside of classified areas and reserved electrical space, unless explicitly called for by the Plans.
- 3. Process equipment and piping has priority over lighting.
 Luminaires shall be placed to avoid conflict with the process and maintenance thereof.
- 4. Heating, Ventilation, and Air Conditioning (HVAC) equipment and ductwork has priority over lighting. Luminaires shall be placed to avoid conflict with HVAC.
- 5. Maintenance vehicle access has priority over lighting. Luminaires shall be placed to not impede maintenance vehicles.
- 6. Luminaires shall be mounted parallel to finished floor or grade, with no tilt angle unless explicitly called for by the Plans.
- 7. Adjust stem or chain lengths to suit field conditions where indicated mounting heights are not feasible.

B. LUMINAIRE SUPPORTS

- 1. Install luminaires with supports, brackets, and trim recommended by the luminaire manufacturer.
- 2. Bottom of luminaires shall be at the elevation noted in the Plans.
- 3. Luminaires shall be secured by manufacturer hardware and fasteners. Nails shall not be used to secure luminaires.
- 4. Supports shall be rated for four times the weight of the luminaire, or 45 kilograms (100 lbs.), whichever is greater. Luminaires weighing more than 23 kilograms (50 lbs.) shall be supported independently from the outlet box.

- 5. Luminaires shall be supported from building structure or ceiling framing. Provide additional framing to support luminaires that cannot be directly mounted to structural members. Structural integrity shall not be compromised due to installation of luminaires.
- 6. Hanging luminaires shall be supported at each quarter point and every eight feet, minimum, by hardware that cannot be dislodged by upward force. Pendants and rods over 120 centimeters long (48 inches) shall be braced to limit swinging.
- 7. Surface-mounted luminaires shall be installed flush and tight to the finished ceiling. Surface-mounted luminaires more than 45-centimeters wide (18 inches) shall be supported at each corner, in addition to the outlet box.

C. INSTALLATION METHODS

- 1. Unless preempted by other work, luminaires shall be installed at the positions and spacings shown on the Lighting Plan(s). Inform the Engineer of all lighting changes in writing. Plan symbols show the required position of the <u>center</u> of each luminaire, but may be undimensioned.
- 2. Luminaires in rows or grids shall be installed true to line. Continuous runs of luminaires shall be installed straight and true, with manufacturer's joining hardware.
- 3. Luminaires located in a common area shall be installed at the same level.

D. ELECTRICAL CONNECTIONS

- 1. All luminaires shall be grounded.
- 2. Each luminaire shall be powered by the circuit and operated by the control device(s) shown on the Plans.
- 3. All luminaires shall be connected according to manufacturer's wiring diagrams.
- 4. All screw terminals shall be torqued to manufacturer's specifications. If no torque values are published by the manufacturer, terminals shall be torqued to values specified in UL 486A.

- 5. All luminaires (except emergency luminaires and exit luminaires) shall be fitted with NEC 410.130(G)-type luminaire disconnect plugs. Ideal PowerPlug or equal.
- 6. Emergency and battery-backed luminaires shall be supplied by both switched lighting conductors AND unswitched charging conductors, powered by the same circuit.
- 7. Power conductors to exit lights shall not be switched.

E. LIGHTING CONTROLS

Lighting controls shall be installed according to the Plans.

F. ENVIRONMENTAL RATINGS

Installation of luminaires shall meet all manufacturer requirements to maintain labeled environmental ratings.

G. CLEANING

Thoroughly clean dirt and debris from all internal and external surfaces. Vacuum interior of luminaires after installation.

Prior to commissioning, wipe all transmitting and reflecting surfaces with damp cloth.

H. SAFE DISPOSAL

Disposal of lamps and luminaires containing hazardous materials (mercury, etc.) shall comply with state and local rules.

3.2 FIELD QUALITY CONTROL

A. DAMAGED LUMINAIRES

During commissioning, Contractor shall inspect each installed luminaire for damage. Damaged luminaires and components shall be replaced at no cost to the owner. Contractor shall replace any transmitting or reflecting surface that is scratched, shattered, or otherwise damaged before completion of work at no cost to the owner.

Metal parts that demonstrate corrosion during the project warranty period shall be replaced at no cost to the owner.

Contractor shall provide replacements for any lamps that fail prior to completion of work.

B. TESTING

Contractor shall demonstrate normal operation of each luminaire. Contractor shall interrupt electrical power to demonstrate proper operation of emergency luminaires.

Malfunctioning luminaires and components shall be repaired or replaced, then tested again.

Contractor shall demonstrate each lighting control to show correct operation, and repair or replace malfunctioning controls.

END OF SECTION

SECTION 16520

EXTERIOR LUMINAIRES

PART 1 GENERAL

1.1 SUMMARY

The work specified in this Section covers exterior lighting devices, including luminaires, lamps, and power supplies; along with outdoor lighting accessories and controls; as well as outdoor mounting hardware, light poles, and accessories; and luminaire mounting, installation, lamping and testing.

1.2 RELATED SPECIFIED ELESEWHERE

Section	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods

1.3 **DEFINITIONS**

A. BALLAST

The power circuit of a gas-discharge (fluorescent, HID, etc.) lamp. Ballasts are either inductive or electronic.

B. DRIVER

The power circuit of an LED Lamp. May be part of a luminaire, or integrated into the lamp itself.

C. EXTERIOR LUMINAIRE

Any LUMINAIRE mounted in an OUTDOOR AREA (as defined in Specification Section 16050).

D. LAMP

The part of a LUMINAIRE that produces light.

E. LED LAMP

A lamp that uses an array of Light Emitting Diodes (LEDs) to produce useful light. Powered by a DRIVER.

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Mason County PUD No. 1 Manzanita Reservoir and Booster Pump Station G&O #22260

F. LUMEN MAINTENANCE FACTOR

The percent of the rated lumen output of a lamp still available after a specified period of time. A lamp capable of only half of its original output after will have a lumen maintenance factor of 0.50 or **L50**.

G. LUMINAIRE

A complete lighting device, exit light, or emergency lighting device. Luminaires consist of one or more LAMPS mounted in a fixture, along with DRIVERS or BALLASTS to power them, and lenses or diffusers to provide the correct lighting distribution.

H. PHOTOCELL

A control device that switches a lighting circuit in response to ambient light level.

1.4 REFERENCES

All applicable ANSI standards.

American Association of State Highway and Transportation Officials [AASHTO] UL 844, 924, 935, 1029, 1598, 8750.

IES LM-79, LM-80, TM-21.

NFPA 70 [NEC] (latest edition, with Washington State Amendments).

Washington State Energy Code (latest edition).

Washington State Administrative Code [WAC] (current edition).

International Building Code (latest edition, with Washington State Amendments).

1.5 SUBMITTALS

Submit under the provisions of Section 01300.

For each required product, submit data sheets with detailed descriptions of the product to be purchased. Identify each data sheet with the corresponding entry on the Lighting Schedule or Bill of Materials. Where data sheets offer a range of options and accessories, mark or highlight each selection, along with all final part numbers.

A. Submit on each luminaire in the Lighting Schedule. Submittal shall contain the following information, as a minimum:

- 1. Manufacturer and part number.
- 2. Product dimensions and weight.
- 3. Environmental rating (NEMA rating).
- 4. Electrical ratings:
 - a. Voltage, Current, and Power
 - b. Power factor
 - c. Efficacy
- 5. Lighting metrics:
 - a. Lumen output
 - b. Lumen maintenance factor
 - c. Color temperature
 - d. Color Rendering Index (CRI)
 - e. Lighting distribution
- 6. Regulatory approvals, certifications, and labels.
- B. Submit on all lighting controls (photocells, motion detectors, etc.). Submittal shall contain the following information, as a minimum:
 - 1. Manufacturer and part number.
 - 2. Product dimensions and weight.
 - 3. Environmental rating (NEMA rating).
 - 4. Electrical ratings (Voltage, Current, and Power).
 - 5. For luminaires to be mounted on poles:
 - a. Effective Projected Area (EPA)
 - 6. Regulatory approvals, certifications, and labels.
 - 7. Detailed wiring diagrams showing both factory- and field-installed wiring for the specific application in this Project. Differentiate between factory- and field-installed wiring.

C. Submit maintenance data for luminaires and lighting controls in the operation and maintenance manual specified in Section 01300.

1.6 QUALITY ASSURANCE

See Section 16050. Coordinate luminaires, mounting hardware, light poles with all other items to be mounted on the exterior of buildings, or on the facility grounds, including the work of other trades.

1.7 EXTRA MATERIALS

Reference Specification Section 16050 for spare parts.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. AVAILABLE MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:

- 1. Acuity Brands, Inc.; Holophane, Lithonia
- 2. Eaton Corp.; Crouse-Hinds, Cooper
- 3. GE Lighting
- 4. OSRAM Sylvania, Inc.

B. "OR EQUAL" PRODUCTS

Luminaires shall be the products specified in the Lighting Schedule in the Plans, or equal. Substitute products shall:

- 1. Use the same lighting technology (LED, Fluorescent, etc.) as the specified luminaire,
- 2. Have the same lumen output, CRI, and IES distribution,

- 3. Not have an input wattage greater than 110 percent of the specified luminaire, and,
- 4. Have the same environmental rating.

2.2 LUMINAIRES

A. POWER

- 1. Luminaires shall be powered at the voltage specified in the Lighting Schedule.
- 2. Power supplies, including ballasts, drivers, and transformers, shall be self-contained within luminaires.

B. QUALITY

1. Manufacturer Labels and Markings

The exterior of lenses and diffusers shall have no visible logos, labels, trademarks, or monograms.

2. Metal Parts

- a. Metal parts shall be free from burrs, scratches, and sharp corners and edges.
- b. Sheet metal components shall be corrosion-resistant aluminum, except as otherwise indicated. Sheet metal shall be formed and supported to prevent warping and sagging.
- c. Exposed structural metal shall be stainless steel.

3. Reflecting Surfaces

Minimum reflectance shall be as follows, except as otherwise indicated:

- a. White surfaces: 85 percent.
- b. Specular surfaces: 83 percent.
- c. Diffusing specular surfaces: 75 percent.
- d. Laminated silver metallized film: 90 percent.

4. Transmitting Surfaces

Transmitting surfaces (including lenses, diffusers, covers, globes, etc.) shall be 100 percent acrylic plastic or water-white, annealed crystal glass, except as otherwise indicated.

a. Plastic

High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

b. Lens Thickness

Minimum 3mm (1/8 inch), except where greater thickness is specified.

5. Finish

Provide manufacturer's standard finish, except where otherwise indicated, applied over corrosion-resistant treatment or primer. Finish shall be free from streaks, runs, holidays, stains, blisters, and other defects.

C. HOUSING

- 1. Luminaire housings shall be rigidly-formed, light-tight enclosures that will not warp, sag, or deform with use.
- 2. Luminaire housings shall have one of the following environmental ratings:
 - a. NEMA 3R where not subject to splashing or hose-directed water.
- 3. Contractor shall provide all materials required to obtain labeled environmental ratings.

D. FUSED LUMINAIRES

Provide fused luminaires for applications:

1. Installed more than eight feet above the floor,

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2. Powered by 277 V circuits, or,

3. Where required by code.

Install a listed fuse and fuse holder approved for the application by the luminaire manufacturer.

2.3 LIGHTING TECHNOLOGIES

Each luminaire shall use the technology specified in the lighting schedule.

A. LED LUMINAIRES

LED Luminaires shall conform to UL 1598 (Luminaires) and UL 8750 (LED Equipment for Use in Lighting Products). LED luminaires shall have a manufacturer warranty of at least two years.

1. Drivers

LED Drivers shall be manufacturer approved for the specific model of luminaire to be installed. Drivers shall meet the following specifications:

- a. UL 8750 listed.
- b. Certified by NRTL acceptable to the State of Washington.
- c. Compliant with FCC Part 15, Class A.
- d. Power Factor: greater than 0.90.
- e. Supply circuit THD: less than 10%.
- f. Temperature Rating: -20 to +40 degrees Celsius.

2. Lamps

LED Lamps shall be an integral part of the luminaire, and rated to last the entire design lifetime of the luminaire. LED lamps shall have the following specifications:

- a. Color Temperature: 4000K, unless otherwise indicated.
- b. CRI: at least 80 CRI.

c. Lamp Life: at least 60,000 hours, L80.

PART 3 EXECUTION

3.1 INSTALLATION

A. COORDINATION WITH OTHER WORK

- 1. Coordinate lighting with general electrical work, and with other trades.
- 2. Locate luminaires outside of classified areas and reserved electrical space, unless explicitly called for by the Plans.
- 3. Process equipment and piping has priority over lighting.

 Luminaires shall be placed to avoid conflict with the process and maintenance thereof.
- 4. Heating, Ventilation, and Air Conditioning (HVAC) equipment and ductwork has priority over lighting. Luminaires shall be placed to avoid conflict with HVAC.
- 5. Vehicle access has priority over lighting. Luminaires shall be placed to maintain required clearance above right-of-way.
- 6. Adjust mounting heights to suit field conditions where indicated heights are not feasible.

B. LUMINAIRE SUPPORTS

- 1. Install luminaires with supports, brackets, and trim recommended by the luminaire manufacturer.
- 2. Luminaires shall be secured by manufacturer hardware. Nails shall not be used to secure luminaires.

C. INSTALLATION METHODS

1. Unless preempted by other work, luminaires shall be installed at the positions and spacings shown on the Lighting Plan(s). Inform the Engineer of all lighting changes in writing. Plan symbols show the required position of the <u>center</u> of each luminaire but may be undimensioned.

- 2. Luminaires in rows or grids shall be installed true to line. Continuous runs of luminaires shall be installed straight and true, with manufacturer's joining hardware.
- 3. Luminaires located in a common area shall be installed at the same level.

D. ELECTRICAL CONNECTIONS

- 1. All luminaires and light poles shall be grounded.
- 2. Each luminaire shall be powered by the circuit and operated by the control device(s) shown on the Plans.
- 3. All luminaires shall be connected according to manufacturer's wiring diagrams.

3.2 FIELD QUALITY CONTROL

A. DAMAGED HARDWARE

During commissioning, Contractor shall inspect each lighting device. Damaged luminaires, supports, and components shall be replaced at no cost to the owner. Contractor shall replace any transmitting or reflecting surface that is scratched, shattered, or otherwise damaged before completion of work at no cost to the owner.

Metal parts that demonstrate corrosion during the project warranty period shall be replaced at no cost to the owner.

Contractor shall provide replacements for any lamps that fail prior to completion of work.

B. TESTING

Contractor shall demonstrate normal operation of each luminaire. Contractor shall interrupt electrical power to demonstrate proper operation of emergency luminaires.

Malfunctioning luminaires and components shall be repaired or replaced, then tested again.

Contractor shall demonstrate each lighting control to show correct operation, and repair or replace malfunctioning controls.

*** END OF SECTION ***

SECTION 16910

PLC HARDWARE AND SOFTWARE PROCUREMENT

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section consists of hardware and software procurement of Programmable Logic Controllers (PLCs) and Operator Interface Units (OIUs).

For programming requirements, reference the Plans.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

TP241 -

Section	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods

1.3 REFERENCES

<u>Reference</u>	Title
NEMA	National Electrical Manufacturers Association
ICS-1	General Standards for Industrial Control and Systems
ICS-1.1	Safety Guidelines for the Application, Installation and
	Maintenance of Solid State Control
ICS-4	Terminal Blocks for Industrial Use
ICS-6	Enclosures for Industrial Controls and Systems
Publication NO 250	Enclosures for Electrical Equipment (1000 V maximum)
NFPA	National Fire Protection Association
NEC	National Electric Code

1.4 SYSTEM DESCRIPTION

A. HARDWARE AND SOFTWARE REQUIREMENTS

- 1. The system includes racks, central processing units (CPUs), input/output (I/O) modules, communication modules, power supplies, OIUs, and associated accessory items to provide a complete and functional process control system for the facility.
- 2. The system includes development and application software required by the PLC and OIU hardware to provide complete operation functionality for the facility.

B. PERFORMANCE REQUIREMENTS

1. The installed system is capable of performing the functional and operational algorithms required for control of the process.

1.5 **DEFINITIONS**

Reference specification 16050.

1.6 SUBMITTALS

A. Submit under the provisions of Specification Section 01300.

B. PRODUCT DATA

- 1. Submit an electronic version of the manufacturer's data sheets for hardware components including specific model numbers for each device and size of memory provided in each CPU.
- 2. Submit an electronic version of the manufacturer's installation and user's manuals.
- 3. If required by the software manufacturer provide a "runtime" license of the software to the Owner and provide copies of the license agreement to the Owner.

C. OPERATION AND MAINTENANCE MANUALS

- 1. Provide specific information including:
 - a. An electronic version of the manufacturer's published operation and maintenance manual, user's manual, and troubleshooting guide.
 - b. Information for obtaining assistance and troubleshooting, parts ordering information, and field service personnel requests.

1.7 QUALITY ASSURANCE

A. QUALIFICATIONS

Programmer must have testing hardware and sufficient programming experience to demonstrate operational functionality per Section 2 herein.

1.8 EXTRA MATERIALS

Reference Specification Section 16050 for spare parts.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the requirements, provide products by the following manufacturers:
 - 1. Allen Bradley Company.
 - 2. General Electric Company.
 - 3. Siemens.
 - 4. Square-D.
- B. The PLC and OIU programming software must be the latest version and must be of the same Manufacturer as the PLC and OIU hardware.

2.2 EQUIPMENT

A. Conform to NEMA ICS 1.1 for installation and application of the PLC system.

2.3 COMPONENTS

Hardware is referenced against Allen Bradley PLC products. Other suppliers listed under "MANUFACTURERS" in Section 2 may be selected as "or equal" substitutions to the list below.

The PLC CPU, I/O, OIU, and communication cards shall be provided with the latest version of firmware.

A. CENTRAL PROCESSOR UNIT (CPU)

Allen Bradley: L36E Compact Logix family

B. ANALOG INPUT/OUTPUT (I/O) MODULES

Provide modules as defined in the PLC I/O tables in the Plans. Manufacturers other than Allen Bradley shall match the features and performance criteria of the Allen Bradley products listed below:

1. Analog Input Cards

Channels: 4

Input Type: 4-20 mA

Resolution: 16 bit or +/-15 bit

Differential? Yes Isolated? Yes

2. Analog Output Cards

Channels: 4

Input Type: 4-20 mA Resolution: 16 bit Differential? Yes Isolated? Yes

C. DIGITAL INPUT/OUTPUT (I/O) MODULES

Provide modules as defined in the PLC I/O tables in the Plans.

1. Digital Input Cards

Input Channels: 16

Input Voltage: 24 VDC

Signal Polarity: Sinking/Sourcing (configure card for

sourcing; +24VDC = true)

2. Digital Output Cards

Output Channels: 16

Output Voltage: 24 VDC Signal Polarity: Sourcing

D. POWER SUPPLY UNITS

Manufacturers other than Allen Bradley shall match the features and performance criteria of the Allen Bradley products listed below:

1. For racks using separate power supplies, use the largest power supply available for that specific rack.

E. OPERATOR INTERFACE UNIT

- 1. Provide Operator Interface Units suitable for installation through the control panel door. Every operator interface unit shall meet the following requirements.
 - a. Shall be from the same Manufacturer as the PLC.
 - b. Shall not degrade the environmental rating of the enclosure to which it is installed. For outdoor applications, the OIU shall be provided with a permanently mounted weatherproof cover viewable with the cover closed.
 - c. Shall have a display screen that is 6.5 inch minimum (measured diagonally).
 - d. Shall have 18-bit color graphics
 - e. Shall have a minimum of one 10/100 MB ethernet port and one USB port.
 - f. Shall have a minimum of 512 MB of RAM and 512 MB of storage.
 - g. Shall be provided with a power supply if required to operate from the same power source as the PLC.

2.4 ACCESSORIES

Provide all accessories required, whether indicated or not, for a complete PLC control system to accomplish the requirements of the Plans and Specifications.

2.5 SOURCE QUALITY CONTROL

A. SHOP TEST

- 1. Submit a shop test plan indicating how the test will be conducted, and how equipment operation will be verified.
- 2. Provide a shop test after factory assembly of the PLC control panel and prior to shipment including the following:
 - a. Conduct a burn-in period (minimum of 2 days) where the system is powered continuously and checked for proper operation and operating temperature.
 - b. Provide sufficient PLC programming to demonstrate PLC I/O testing. Include a PC with sufficient software tools to allow visual demonstration of each digital/analog input status/value and be capable of forcing digital and analog outputs.
 - c. Utilize dummy I/Os to verify proper operation.
 - d. Demonstrate that all PLC hardware is fully functional.
 - e. Allow for Owner and/or Engineer representatives to witness the shop test. Provide a minimum of 15 days notice prior to test.
 - f. Do not ship the system prior to successful completion of this testing.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install PLC control system in accordance with manufacturer's written instructions.
- B. Test, verify and demonstrate access to and functionality of PLC system.

*** END OF SECTION ***

SECTION 16940

CONTROL PANELS

PART 1 GENERAL

1.1 SCOPE

The work specified in this Section includes control panel [03 CP 02]. Skid manufacturer's panel is specified in Div 11.

1.2 RELATED WORKS SPECIFIED ELSEWHERE

Section	<u>Item</u>
01300	Submittals
16910	Programmable Logic Controller (PLC) Hardware
Division 16	Electrical

1.3 **DEFINITIONS**

A. CONTROL PANELS

Reference Section 16050.

B. CONTROL POWER

Control power is considered electrical power at either 120 VAC or 24 VDC that powers control or instrumentation devices. Control power circuits are less than 150 VAC and less than or equal to 20 Amps.

Examples:

- 1. 120 VAC or 24 VDC device power to instruments such as flow meters, chlorine analyzers, dissolved oxygen transmitters, and etc.
- 2. 120 VAC or 24 VDC device power to control devices such as PLCs, radios, network switches, and etc.
- 3. 120 VAC power to control devices such as motor operated valves, metering pumps (even when through dedicated receptacles), lighting circuits (controlled within a lighting control panel), and etc.

1.4 REFERENCES

Reference	<u>Title</u>
NEMA	National Electrical Manufacturers Association
ICS-1	General Standards for Industrial Control and Systems
ICS-4	Terminal Blocks for Industrial Use
ICS-6	Enclosures for Industrial Controls and Systems
Publication No. 250	Enclosures for Electrical Equipment (1000 V maximum)
NFPA	National Fire Protection Association
NEC	National Electric Code
JIC-EMP-1	Joint Industrial Council

1.5 SYSTEM DESCRIPTION

A. CONTROL PANELS

- 1. Reference Section 16050, Definitions.
- 2. Control panels shall be fabricated similar to those shown on the Plans. With the exception of the discrete and analog I/O terminal blocks, the exact dimensions and component layout is not critical.
- 3. The system includes new control panels for control of process equipment. Some of the control panels are provided under Division 16. Some panels are provided under other Divisions with equipment specified in those Divisions. Control panels, whether provided under Division 16 or other Divisions, shall meet the requirements of this Section.

1.6 SUBMITTALS

A. SHOP DRAWINGS

- 1. See Section 01300.
- 2. Dimensioned or to-scale panel layout drawings.
- 3. Materials of construction.
- 4. Drawings showing conduit and wiring access locations.
- 5. Elementary wiring diagrams and terminal block drawings, differentiating between panel and field wiring.

- 6. Bill of Materials describing the reference name or number, quantity, complete English language description, manufacturer, model number, local supplier, and wiring or piping reference. Information shall include manufacturer name, catalog descriptions, wiring and piping diagrams, dimensional plans, anchoring details, installation instruction, and test results.
- 7. Loop diagrams with all components connected per ISA standards.
- 8. Nameplate text.
- 9. Heat calculations and relationship to enclosure fan, heater, air conditioner.
- 10. UPS system loading and resulting back-up run time.

B. OPERATION AND MAINTENANCE MANUALS

- 1. See Section 01300.
- 2. Provide manufacturer's operating and maintenance manuals for each device or item provided.
- 3. Recommended spare parts stocking list.

C. CONTRACTOR CERTIFICATION

1. If the submitted panel(s) are to be labelled and listed with an agency other than UL, submit proof of certification as a panel shop by that agency. For UL listed panels, the Contractor fabricating panels shall submit proof of certification as a UL 508A and/or UL 698A (if required) panel shop upon request.

1.7 QUALITY ASSURANCE

- A. Make shop drawings available prior to placement of conduits in slabs to ensure placement is coordinated with panel access locations.
- B. Test panels prior to shipment to project site.
 - 1. The entire assembled panel shall be tested to be free from grounds and shorts.

- Controllers, circuits, and interlocks shall be rung out and tested to assure that they function correctly before the panel is shipped.
 Prior to placement of conduit feeds, assure approved control panel layouts are available.
- C. Panels supplied under this Section are provided by a single manufacturer.
- D. Provide panels labeled by a recognized testing laboratory acceptable to the State of Washington Department of Labor and Industries meeting the requirements of Article 409 of the NEC.
- E. Revise all drawings upon completion of the work to show "as shipped" condition of the panel.

1.8 STORAGE AND HANDLING

- A. After completion of shop assembly and testing, enclose panels in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from dust and moisture. Place dehumidifiers inside the polyethylene covering.
- B. Skid-mount the equipment for final transport. Show shipping weight on shipping tags, together with instructions for unloading, transporting, storing, and handling on job site.

1.9 EXTRA MATERIALS

Reference Specification Section 16050 for spare parts.

PART 2 PRODUCTS, MATERIALS

2.1 CONTROL PANEL ENCLOSURES

A. ENCLOSURE BODIES

Control panel enclosures are factory listed and labeled enclosures fabricated of stretcher leveled steel welded into a rigid, self-supporting structure. Control panels shall be completely enclosed, welded construction, self-supporting, and gasketed dust-tight.

1. Panels mounted indoors shall be NEMA 1 gasketed.

Exception:

Unless indicated otherwise in the Plans.

B. HINGES AND HINGE PINS

- 1. Provide full length (continuous) piano hinges rated for 1.5 times the weight of the door plus all door-mounted instruments.
- 2. Hinges shall be welded to all surfaces and shall match the metallurgy of the enclosure.
- 3. Hinge pins shall be 316L stainless steel on all panels.

C. MOUNTING FEET

If called for, mounting feet shall be the height indicated on the Plans and shall be made of the same material as the enclosure body that it supports.

2.2 CONTROL PANEL POWER DEVICES

A. FUSES

1. Power Circuit Fusing

Reference Specification 16410, Enclosed Switches, Fuses, and Circuit Breakers.

2. Control Power Fusing

Control power fuses are FRN for ratings above 10 amperes and FNQ for 10 amperes and below. FRN fuses are mounted in phenolic blocks with a fuse puller mounted adjacent to them. FNQ fuse holders are DIN-rail mounted type, 12A, 300 V minimum, hinged to disconnect and replace fuse, with blown fuse indicating light. Label all fuseholders with fuse identification number and fuse size and type. Provide five spare fuses of each type and size in each panel. Provide box mounted on panel interior marked "SPARE FUSES" to hold the spares.

3. PLC I/O Field Connection Fusing

- a. 24 VDC Fusing
 - i. Fuses for 24 VDC circuits shall be 5 x 20 mm, glass body, fast acting, 250 VAC, sized by the integrator unless specifically called in the Plans or Specifications.

ii. Fuse holders for 24 VDC circuits shall be DIN-rail mounted type, provided in fusible terminal blocks, for 5 x 20 mm fuses, black, hinged to open, 10-57 VAC/VDC, with red LED blown fuse indicators, #30 AWG - #12 AWG, 15A.

b. 120 VAC Fusing

- i. Fuses for 120 VAC circuits shall be 1/4" x 1-1/4", glass body, time-delay, 250 VAC, sized by the integrator unless specifically called in the Plans or Specifications.
- ii. Fuse holders for 120 VAC circuits shall be DIN-rail mounted type, provided in fusible terminal blocks, for 1/4" x 1-1/4" fuses, black, 100-300 VAC, with neon blown fuse indicators, #30 AWG #12 AWG, 15A.

B. CIRCUIT BREAKERS

1. Power Circuit Breakers

Reference Specification 16410, Enclosed Switches, Fuses, and Circuit Breakers.

2. Control Power Circuit Breakers

Control power circuit breakers shall be DIN-rail mounted type, miniature, 240 VAC, single pole, 10 kAIC (minimum) @ 240 VAC, "C" curve (inductive) trip characteristics, 1,500 VAC dielectric strength (minimum), #14 to #12 AWG 75 degrees C line and load screw terminals, UL 489, CSA 22.2 No. 5.1; Allen Bradley Bulletin 1492-SPU Series A or equal.

C. SURGE PROTECTIVE DEVICES

1. For Control Power Circuits

Control power SPDs shall protect L-N, L-G and N-G and have a minimum peak surge current of 40kA, shall have terminals that accept a #12 AWG conductor, shall be rated for the voltage shown in the Plans, shall be listed, and shall have a terminal configuration with separate Line, Neutral, and Ground connections.

Control power SPDs shall meet Mil-Std-220 for maximum EMI/RFI attenuation.

Control power SPDs shall be DIN-rail mounted, 1-inch wide maximum.

Control power SPDs shall be Cooper Bossman #BSPMA1_S2GR or equal.

2. For Telecommunications

All incoming phone and internet services shall be provided with surge protection.

- a. Intermatic IG2TM or equal for twisted pair copper.
- b. Intermatic IG4TM or equal for coaxial cable.

D. UPS SYSTEMS

1. 24 VDC UPS Systems

24 VDC UPS Systems shall include the 24 VDC power supplies, the converters, batteries, and redundancy modules as described herein. Each of these devices shall be DIN-rail mounted, industrial rated, packaged, and listed. Custom built circuits boards and loose electronic devices shall not be allowed. Provide a minimum of 30 minutes of backup time or that shown on the Plans, whichever is the greater.

- a. A single 24 VDC UPS system shall include, as a minimum, the following devices:
 - i. 1x 24 VDC Power Supply;
 - ii. 1x 24/12 VDC UPS Controller;
 - iii. 1x 12 VDC Backup Battery.

The minimum DC UPS system shall be capable of providing 10 Amps at 24 VDC continuously. The specifications listed below are for a minimum system. Increase the system ampacity as called on the Plans.

b. 24 VDC Power Supplies

24 VDC power supplies shall be 120 VAC input, 24 VDC output, 10 A minimum, with +/- 1 percent voltage regulation from no-load to full-load. Process power supplies shall be sized by the integrator and increased in size as required. Provide the power supply sizing calculations with the product submittal.

i. 10 A: PULS #QS10.241 or equal.

c. 24 VDC UPS Controllers

DC UPS controllers shall be 24-28 VDC normal input, 12 VDC battery input with a 24 VDC, 10 A output (minimum) and a 12 VDC, 5 A output, with indicating LEDs. The unit shall monitor the battery and provide a dry contact output to indicate that the battery should be replaced.

i. 24 VDC @ 10 A, 12 VDC @ 5A: PULS #UB10.245 or equal.

d. 12 VDC Backup Batteries

Batteries shall be fully sealed gel type. Batteries shall be rated for 12 Ah (minimum) and rated to operate between -40 degrees C to 60 degrees C.

2.3 CONTROL PANEL CONTROL DEVICES

A. PILOT LIGHTS

- 1. Pilot lights shall be heavy duty, Class 9001, Type J, NEMA 4 (watertight) and NEMA 13 (oil-tight), metal collar, push-to-test, multi-segmented LED with red, green, amber, blue, clear, white, or yellow colored caps as shown on the Plans.
 - a. Allen-Bradley
 - b. Cutler-Hammer
 - c. General Electric
 - d. Siemens

e. Square D

B. PUSH BUTTONS

1. Push buttons shall be heavy duty, Class 9001, Type K, UL Types 4 and 13, NEMA 4 (watertight) and NEMA 13 (oil-tight), metal collar, non-illuminating, with full button guard. Contact block shall be provided with 1 N.O. and 1 N.C. contacts minimum with the ability to stack additional blocks. Provide additional blocks as required.

Pushbutton actuators may be standard, mushroom head, recessed (flush collar), or deep recessed (deep collar) as required.

- a. Allen-Bradley
- b. Cutler-Hammer
- c. General Electric
- d. Siemens
- e. Square D

C. SELECTOR SWITCHES

1. On-Off Selector Switches

ON-OFF selector switches shall be Class 9001, Type K, UL types 4 and 13, NEMA 4 (watertight) and NEMA 13 (oil-tight), metal collar, non-illuminating push button contact blocks with 2-position operators and standard knob. Contact block shall be provided with 2 N.O. and 2 N.C. contacts minimum with the ability to stack additional blocks. Provide additional blocks as required.

The 2-position operator shall be manual rotation to left and manual rotation to right. Two contact block stacks shall be provided. In both contact block stacks, one set of contacts is closed in the left position and open in the right position. In both contact block stacks, one set of contacts is closed in the right position and open in the left position.

a. Allen-Bradley

- b. Cutler-Hammer
- c. General Electric
- d. Siemens
- e. Square D

2. Hand-Off-Auto (HOA) Selector Switches

HOA selector switches shall be Class 9001, Type K, UL types 4 and 13, NEMA 4 (watertight) and NEMA 13 (oil-tight), metal collar, non-illuminating push button contact blocks with 3-position operators and standard knob. Contact block shall be provided with 2 N.O. and 2 N.C. contacts minimum with the ability to stack additional blocks. Provide additional blocks as required.

The 3-position operator shall be manual rotation to left and right from center and manual return back to center. Two contact block stacks shall be provided. In both contact block stacks, one set of contacts is closed in the left position and open in the center and right positions. In both contact block stacks, one set of contacts is closed in the right position and open in the center and left positions.

- a. Allen-Bradley
- b. Cutler-Hammer
- c. General Electric
- d. Siemens
- e. Square D

D. RELAYS

Regardless of the technology of a relay's control (from simple to programmable), the relay's output technology shall be the electromechanical type. Electronic outputs (triacs, thyristors, transistors, etc.) shall not be allowed.

1. Contactor relays

Contactor relays for switching 120 VAC power circuits including, but not limited to, lighting, solenoid valves, and small motors shall be electro-mechanical machine tool, heavy-duty type, NEMA rated, with 120 VAC/24 VDC coils and double-break contacts rated at 20 A at 250 VAC. Equip relays with surge suppressers. IEC rated relays are not permitted.

2. Control relays

Control relays for logic control circuits shall be permitted to be miniature "ice cube" type DPDT or 4PDT with 24V or 110-120V AC/DC coils with a mechanical life of 20 million operations minimum and an electrical life of 1 million operations minimum at 1 amp. The dielectric strength between the coil and contacts shall be 2,000 VAC for 1 minute. Contacts shall be rated at 10A at 250 VAC, 10A at 30 VDC. Relays shall have a maximum pickup and release time of 25 milliseconds and a minimum drop voltage of 30 percent of the rated voltage. Relays shall include non-polarized LED coil indictors. Relays shall be IDEC, P&B/Tyco or equal.

3. Alternating relays

Alternating relays shall have 24 VDC or 120 VAC coils as required for the application.

a. Duplex Alternating Relays

2-state alternating relays shall be DPDT with the transition between states occurring on loss of power to the coil.

b. Triplex Alternating Relays

Triplex alternating relays shall operate on 3 switch inputs, with the loads falling out in the reverse order of their pull-up. Relays shall be octal socket type with 120 VAC or 24 VDC coils. Contacts shall be rated at 3 A at 24/120 VAC with a full load electrical life of 100,000 operations and a mechanical life of 10,000,000 operations.

Relays that operate with a first-on, first-off control sequence shall not be allowed.

Macromatic (Triplexor Only), #ATP120A1 (120 VAC coil) or #APT024A1 (24 VDC coil) or equal.

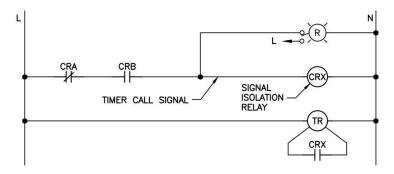
4. Time delay relays

Time delay relays shall be electronic, programmable, multifunction type with a minimum of two Form C (DPDT) contacts rated at 10 A into resistive loads. Timers shall have a selectable timing range from 0.05 seconds to 999 hours. The following features shall be provided on the front of the timer for easy and clear adjustability:

- a. Function selection (type of delay function);
- b. Time setting (3 digits);
- c. Timing range (seconds, minutes, hours);
- d. Table showing the selectable functions;
- e. LED indicator that indicates timing mode and time out condition.

On-delay timers (TDAE, <u>Time Delay After Energization</u>) shall be 8-pin octal socket style with 120 VAC or 24 VDC coils; Macromatic #TD-70222 and #TD-70228 respectively.

Off-delay timers (TDAD, <u>Time Delay After De-energization</u>) shall be 11-pin socket style with 120 VAC or 24 VDC coils, requiring an isolated trigger (see figure below); Macromatic #TD-71622 and #TD-71628, respectively.



5. PLC 24 VDC Output Buffer Relays

PLC 24 VDC output buffer relays shall be miniature DIN-rail DPDT type with silver-nickel alloy contacts rated at 8 amps @ 250 VAC/30 VDC (resistive load), 4 amps @ 250 VAC/30 VDC (inductive load), and 100,000 operations at full rated load with a dielectric strength between contacts of 1,000 VAC for 1 minute.

The relay coil shall be 24 VDC, with a mechanical life of 50 million operations and a dielectric strength between the coil and contacts of 5,000 VAC for 1 minute. Relays shall have a maximum pickup time of 15 milliseconds and release time of 10 milliseconds and a minimum drop voltage of 10 percent of the rated voltage.

Relays shall include a non-polarized LED coil indicator.

Relays shall include a DIN-rail mounting socket, 0.625-inch wide maximum with finger-safe screw terminals and replacement locking lever. DPDT relays and sockets shall be stackable at 0.625 inch.

Relays shall be IDEC RJ2S-CL-D24 or exact equal. Sockets shall be IDEC SJ2S-07L or exact equal.

6. PLC 120 VAC - to - 24 VDC Input Buffer Relays

PLC 120 VAC input buffer relays shall be miniature DIN-rail DPDT type with silver-nickel alloy contacts rated at 8 amps @ 250 VAC/30 VDC (resistive load), 4 amps @ 250 VAC/30 VDC (inductive load), and 200,000 operations at full rated load with a dielectric strength between contacts of 1,000 VAC for 1 minute.

The relay coil shall be 120 VAC, with a mechanical life of 30 million operations and a dielectric strength between the coil and contacts of 5,000 VAC for 1 minute. Relays shall have a maximum pickup time of 15 milliseconds and release time of 10 milliseconds and a minimum drop voltage of 30 percent of the rated voltage.

Relays shall include a non-polarized LED coil indicator.

Relays shall include a DIN-rail mounting socket, 0.625-inch wide maximum with finger-safe screw terminals and replacement locking lever. DPDT relays and sockets shall be stackable at 0.625 inch.

Relays shall be IDEC RJ2S-CL-A120 or exact equal. Sockets shall be IDEC SJ2S-07L or exact equal.

E. THERMAL SETPOINT CONTROLLERS/TRANSMITTERS

- 1. Motor Winding Temperature Monitoring and Alarming Thermal Setpoint Controllers shall be:
 - a. 2-wire, 3-wire, and 4-wire Ni100 and Pt100 RTD compatible;
 - b. B, E J, K, N, R, S, T (ITS 90/IEC 584), L (DIN 43710) thermocouple compatible;
 - c. Provide a linearized 4-20 mA isolated output;
 - d. Provide an adjustable over- and under- temp Form A, 250 VAC, 500 VA (2 A) output contact;
 - e. Provide line monitoring for sensor wire-break and short circuit;
 - f. Capable of operating between 20 and 250 VAC input power;
 - g. Provide galvanic separation of input circuits, output circuits, and power supply;
 - h. Provide no more than 0.2 mA of sensor current;
 - i. Provide galvanic separation of input circuits, output circuits, and power supply;
 - j. Turck Interface Module, Ex-Temperature Measuring Amplifier, 1-Channle; Part Number IM34-12EX-RI or equal.

F. ETHERNET SWITCHES

Ethernet switches shall be industrial grade, 10/100 MB, DIN-rail mounted type, 24 VDC powered, 8-port; N-Tron 300 series or equal.

Exceptions:

• If the requirement shown on the Plans is greater than 8 ports, then provide the higher value.

G. AUTODIALERS

As specified on the Plans.

2.4 CONTROL PANEL ANCILLARY DEVICES

A. RECEPTACLES MOUNTED IN CONTROL PANELS

120 VAC power to convenience and device receptacle in control panels shall not be derived from the same panelboard circuit as that used for process control devices (PLC, flow meters, autodialers, DC power supplies, etc.).

1. Convenience Receptacles

Convenience receptacles in control panels are not dedicated and are intended for providing 120 VAC convenience power for non-motor-operated equipment.

Convenience receptacles shall be GFCI, 15 Amp, 125 VAC, duplex, white, in a DIN-rail mount, cast aluminum box. Stamped steel boxes shall not be used.

2. Device Receptacles

Device receptacles are dedicated for communication and control devices operating within the control panel on a continuous basis. These include devices with 120 VAC power packs like VPNs, Fiber-To-Voice Converters, Data-To-Voice Converters, and etc.

Device receptacles shall be non-GFCI, 15 Amp, 125 VAC, duplex, white, in a DIN-rail mount, cast aluminum box. Stamped steel boxes shall not be used.

On Communication Patch Panels, these receptacle circuits can be extended with surge- and load-protected power strips.

3. Combination Port

The combination port shall consist of a simplex 120 VAC receptacle and a Category 5e ethernet port mounted on a single bulkhead.

The simplex receptacle shall have a placard stating "For Computer Use Only" along with the current rating. The current rating shall not be less than 3 A. If the receptacle rating is less than 15 A, the combination port shall have an integrated circuit breaker, operable without opening the enclosure, allowing the receptacle to be wired to an ordinary 15 A circuit.

The Category 5e ethernet port shall be a female RJ-45 connector, allowing an operator to connect a computer to the PLC over ethernet without opening the enclosure.

The bulkhead shall be a listed assembly. The bulkhead shall be installed in a manner that preserves the environmental rating of the enclosure. The bulkhead shall have a hinged cover that protects the combination port when not in use.

B. PANEL LIGHTING

For all panels so designated on the Plans, provide an LED lighting package, under cabinet style, hardwired, 120 VAC, with integral dooractivated ON/OFF switch.

120 VAC power to the panel light shall not be derived from the same Panelboard circuit as that used for process control devices (PLC, flow meters, autodialers, DC power supplies, etc.).

C. PANEL COOLING FANS

Provide a panel cooling system in enclosures that contain motor starters, drives, PLCs, RTUs, and other electronic devices that can generate heat and have maximum operating temperature limits unless specifically shown otherwise in the Plans. The panel cooling system shall include one or more fans with a thermostat as a minimum. The cooling system shall be sufficiently sized to maintain an internal enclosure temperature below the maximum operating temperature of all internal devices.

Provide a thermostat for cooling, N.O. contact, adjustable setpoint range 32 to 140 degrees F, 15 Amp-rated contact at 120 VAC.

Cooling fans shall be configured to exhaust air. Vents shall be provided for supply air. Layout fans and vents in such a manner as to:

- 1. Maximize cooling of critical components;
- 2. Minimize air flow restriction;
- 3. Eliminate entry of water or dust particles into the enclosure.

Provide vent covers over fan and vent openings to eliminate rain and moderate washdown for all outdoor panels and all panels so designated on the Plans

Provide a "washdown filter" fan set, capable of eliminating sprayed water entry, stainless steel, 120 VAC, 310 CFM, 3.8 Amps max., 18" x 10" x 5".

120 VAC power to panel fans shall not be derived from the same panelboard circuit as that used for process control devices (PLC, flow meters, autodialers, DC power supplies, etc.).

D. TERMINAL BLOCKS

1. For Power Circuits > 30 Amps

Terminations for power circuits greater than 150 V to ground or greater than 30 A shall be made using 600 VAC, listed, screw type, Power Distribution Blocks.

2. For Non-Fused Control, Instrumentation, and Power Circuits < 30 VDC, < 150 VAC, and <= 30 Amps

Provide standard feed-through DIN-rail type IEC terminal blocks, single circuit, screw terminal type, #22 - #10 AWG, rated 600 V AC/DC at 30 A, white or grey; Allen Bradley Bulletin 1492-J4 series or equal.

Exceptions:

• For equipment/chassis grounded circuits

Provide DIN-rail type IEC grounding blocks, single circuit, screw terminal type, #22 - #10 AWG, rated 600 V AC/DC

at 30 A, green/yellow in color; Allen Bradley Bulletin 1492- WG6 or equal. These ground blocks shall be inherently connected to the din rail.

• For instrumentation cable shield terminations (reference Section 3.1.E)

Provide standard feed-through DIN-rail type IEC terminal blocks, single circuit, screw terminal type, #22 - #10 AWG, rated 600 V AC/DC at 30 A, blue; Allen Bradley Bulletin 1492-J4-B or equal.

5. Terminals used for digital and analog I/O field connections shall be grouped as shown in Section 3.1.E, FABRICATION, FIELD CONNECTIONS TO PLC I/O.

E. PANEL WIRING PRODUCTS

- 1. Power Circuit Wiring; Reference Specification 16120.
- 2. Control Circuit Wiring; Reference Specification 16120.
- 3. Analog PLC I/O Wiring

Signal cables connected completely inside control panels between analog input and output field terminal groupings and their associated PLC analog cards shall be #22 AWG, stranded, tinned copper, twisted pair, 300 V, 100 percent overall foil shielded cable with #22 AWG tinned copper drain wire; Belden #8451 or equal.

2.5 CONTROL PANEL ACCESSORIES

A. PANEL NAMEPLATES AND IDENTIFICATION

- 1. Identify each item on the control panel with rectangular nameplates.
- 2. Provide nameplates of rigid phenolic plastic laminate with engraved lettering or engraved metal plate with filled lettering. Use black background with white lettering.
- 3. Minimum letter height is 1/2 inch for instrument description and 1/4-inch height for instrument tag number.

- 4. Provide each panel with a 2-inch by 10-inch (minimum) nameplate with 1-inch-high lettering with panel identification.
- 5. Abbreviations are not permitted unless approved by the Owner or specifically shown on the nameplates, schedules, or plans.
- 6. Install nameplates plumb and parallel to the lines of doors or structure to which they are attached. Attach to the sheet metal structure by a thin coat of adhesive and sheet metal screws. Make adhesive and screw applications in such a manner as to avoid nameplate buckling or distortion due to use of excessive adhesive or over tightening of screws.

PART 3 INSTALLATION

3.1 FABRICATION

A. GENERAL

- 1. Control panels are factory or shop fabricated units completely assembled, wired, and tested before shipment to the job site.
- 2. Panel construction, in general, meets JIC EMP-1 standards and applicable NEMA and IEEE standards.

Exception:

- Where open penetrations are required, such as for fans and vents, the NEMA rating of the panel may be modified to meet the intent of the design and fit the environment of the application. Verify the change of a panel's NEMA rating with the Engineer.
- 3. The panels shall be constructed in accordance with Article 409 of the NEC and electrical testing laboratory standards and shall be so labeled (the standards of a recognized electrical testing laboratory).
- 4. Size panels for enclosed equipment and available space for mounting of panel or as shown on the Plans.
- 5. Panel material, penetrations, and etc. shall be verified for proper operation in their intended locations. Issues and concerns shall be brought to the attention of the Engineer prior to fabrication within or on the panel.

B. COMPONENT INSTALLATION

- 1. Minimize welding to panel fronts and avoid distortion of panel metal.
- 2. Reinforce around areas of the enclosure weakened by openings or mounting of heavy equipment/components.
- 3. Accurately and cleanly cut or nibble cutouts, and finish free of sharp edges or burrs. Make cutouts plumb, level, and on-line vertically or horizontally within 1/32 of an inch where components are in rows or columns.
- 4. Provide minimum 1-5/8-inches spacing between horizontal rows of externally mounted components; 1-1/2 inches minimum between vertical columns of components.
- 5. The distance from the bottom row of components to the floor shall be not less than 36 inches, unless specifically shown as less. In general, all indicating lights, pushbuttons, etc., shall be mounted in accordance with the sequence of operation from left to right and top to bottom.
- 6. Provide minimum 1/4-inch spacing between components mounted on the panel sub-plate, Provide minimum spacing between the component and the wire duct of 1-1/2 inches above, and 1 inch below.
- 7. Components mounted in the interior shall be fastened to an interior subpanel using machine screws plus adhesive to insure vibration-free attachment.
- 8. Interior component mounting and wiring shall be grouped as much as possible by function and then by component type. Interiors shall be so arranged that control relays, terminal blocks, fuses, etc., can be replaced or added without disturbing adjacent components.
- 9. Open batteries provided to support DC UPS systems shall be mounted on 316L stainless steel shelves and provided with non-conducting bracing straps to firmly hold the battery in place. The shelves shall have a raised lip around all sides that are not in contact with a wall. The bottom of the shelf shall be at least 4 inches above the bottom of the enclosure.

Batteries provided with manufacturer's mounting systems do not require the additional stainless steel shelving.

C. PANEL WIRING METHODS

- 1. Provide panel wiring sizes and colors per Specification 16120.
- 2. Provide PLC analog and digital input and output circuit field terminations and wiring methods per Section 3.1.E.
- 3. Field wiring terminations to control panel terminal strips shall be connected as shown on the Plans. Cable shields or "drain" wires shall be terminated as per manufacturer's recommendations.
- 4. Provide a chassis-connected equipment ground bus at the bottom of PLC control panels.
- 5. Provide an isolated ground bus, dedicated solely for analog shield connections, adjacent to the equipment ground bus. Provide a separate and dedicated #10 AWG minimum green-insulated ground wire from the Panelboard ground bus to the isolated ground bus.
- 6. Provide raceways for panel wiring.
 - a. Size raceways per the requirements of NEC.
 - b. Provide panel wireways between each row of components, and adjacent to each terminal strip.
 - c. Wireways are a minimum of 1-inch wide and 3-inches deep with removable snap-on covers and perforated walls for easy wire entrance. Wireways shall be constructed of non-metallic materials with a voltage insulation in excess of the maximum voltage carried therein Panduit type LG, Panel Channel or equal
- 7. Run wires neatly in wiring duct tied and bundled with tie wraps or similar materials.
- 8. Provide wire bending space per NEMA ICS 6.
- 9. Label wiring within the panel with wire numbers using the same number on both ends of the wire. Identify each wire termination,

- including long jumpers, with wire markers. Arrange wire labels to permit reading of identification when installed.
- 10. Connect wiring internal to the panel to one side, leaving the opposite side for field terminations. Connect no more than two wires to any one control terminal point.
- 11. Arrange wiring inside the panel to separate instrumentation cables, conductors, and terminals at least 12 inches from 120 VAC power and control circuits.
- 12. Connect electrical equipment grounds to the chassis grounding bus.
- 13. Provide necessary power supplies for control equipment.

D. WIRE TERMINATION METHODS

- 1. Power conductors terminated on Power Distribution Blocks shall be covered with the block manufacturer's transparent cover and a caution sticker stating the voltage and available bolted fault current.
- 2. Terminate one end of all instrumentation cable shields to blue isolated-ground terminals (reference Section 2.4.E).
- 3. Provide fused terminals as shown on the Plans or defined herein. Reference Section 2.2 for materials
- 4. Terminals used for 4-20 mA analog input and output circuits shall be grouped as shown herein. This grouping shall be provided for each analog input and output connected to a PLC, whether assigned or unassigned (spare).
- 5. Provide terminal strips for the termination of panel wiring not directly connected to panel mounted devices.
- 6. Terminals shall facilitate wire sizes as follows:
 - a. 120 VAC applications: Wire size 12 AWG and smaller.
 - b. Other: Wire size 14 AWG and smaller.
- 7. Tag each I/O terminal to indicate tag number of the connected device or wire.

- 8. Provide 20 percent excess terminals (minimum) for future expansion.
- 9. Provide a minimum of 1.5 inches between terminal strips and wireways or between terminal strips.

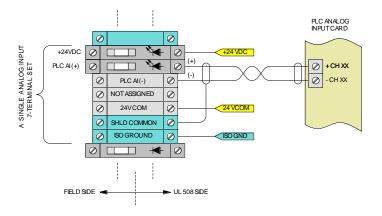
E. FIELD CONNECTIONS TO PLC I/O

1. Analog Input, Termination and Connectivity

Each 4-20 mA PLC analog input shall be connected to a 7-terminal grouping as shown below and as detailed on the Analog Loop Diagrams on the Plans whether the input channel is assigned or unassigned (spare) and whether the input is single-ended, differential, or isolated. No chassis-grounded terminals shall be used. Reference table below.

7-Terminal Analog Input Grouping, Terminal Assignments

Internal Panel		Terminal Type
Connections	Clarification	and Color
+24VDC	+ 24 VDC Power	Fused, Black
PLC AI (+)	PLC Analog Input, +	Fused, Black
PLC AI (-)	PLC Analog Input, -	Feedthrough, Gray
NOT ASSIGNED	2-Device Connection	Feedthrough, Gray
24VCOM	24 V Common	Feedthrough, Gray
SHLD COMMON	Shield Common	Feedthrough, Blue
ISO GROUND	Isolated Ground	Feedthrough, Blue



All connections on the UL 508 side are the same, regardless of the type of field connection.

Bundle all analog input terminal groups in the same sequence as the analog input cards and channels.

Maintain a minimum of 12 inches between analog terminal groups and AC power circuits.

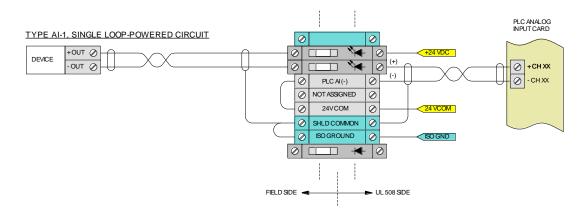
The shields shall be connected at the terminal block-end only. Shields shall not be connected at the PLC cards.

No additional 24 VDC fusing is to be provided.

For cable type between terminal groupings and analog input PLC cards, reference Section 2.4.F.

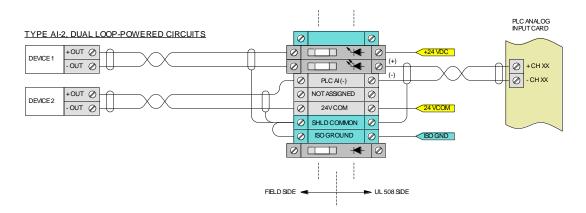
- 2. Analog Input, 7-Terminal Connection Methods
 - a. Field Connection **TYPE AI-1**, connection to a single loop-powered field device

The Figure below shows the method of connecting a PLC analog input to a single loop-powered field device using a 7-terminal standard analog input terminal group.



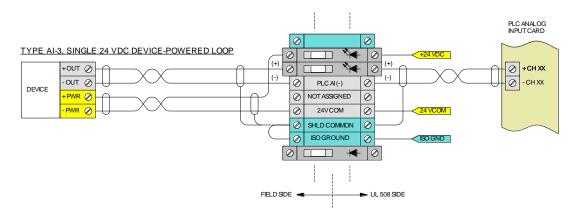
b. Field Connection **TYPE AI-2**, connection to two loop-powered field devices

The Figure below shows the method of connecting a PLC analog input to two loop-powered field devices using a 7-terminal standard analog input terminal group.



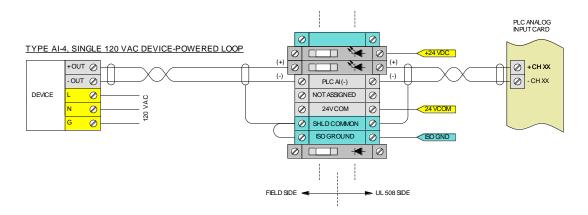
c. Field Connection **TYPE AI-3**, connection to a single 24 VDC device-powered field device

The Figure below shows the method of connecting a PLC analog input to a single 24 VDC device-powered field device using a 7-terminal standard analog input terminal group. Device power is provided by the control system power.



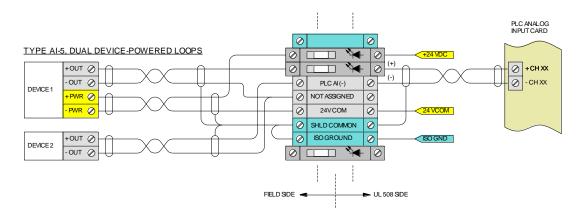
d. Field Connection **TYPE AI-4**, connection to a single 120 VAC device-powered field device

The Figure below shows the method of connecting a PLC analog input to a single 120 VAC device-powered field device using a 7-terminal standard analog input terminal group.



e. Field Connection **TYPE AI-5**, connection to a set of 24 VDC device-powered and loop-powered field devices

The Figure below shows the method of connecting a PLC analog input to two field devices, with at least one requiring 24 VDC device power using a 7-terminal standard analog input terminal group. Device power is provided by the control system power.

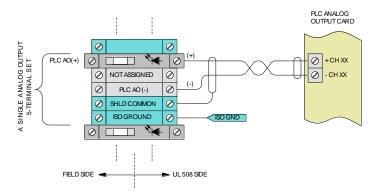


3. Analog Output, Termination and Connectivity

Each 4-20 mA PLC analog output channel shall be connected to a 5-terminal grouping as shown below and as detailed on the Plans whether the input channel is assigned or unassigned and whether the output is isolated or not. No chassis-grounded terminals shall be used. Reference table below.

5-Terminal Analog Input Grouping, Terminal Assignments

Internal Panel		Terminal Type
Connections	Clarification	and Color
PLC AO(+)	PLC Analog Output, +	Fused, Black
NOT ASSIGNED	2-Device Connection	Feedthrough, Gray
PLC AO(-)	PLC Analog Output, -	Feedthrough, Gray
SHLD COMMON	Shield Common	Feedthrough, Blue
ISO GROUND	Isolated Ground	Feedthrough, Blue



All connections on the UL 508 side are the same, regardless of the type of field connection.

Bundle all analog output terminal groups in the same sequence as the analog output cards and channels.

Maintain a minimum of 12 inches between analog terminal groups and AC power circuits.

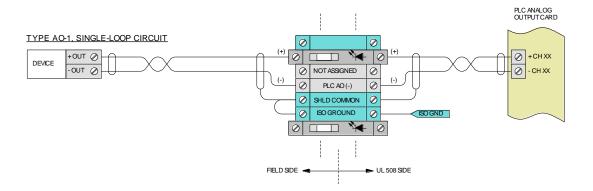
The shields shall be connected at the terminal block-end only. Shields shall not be connected at the PLC cards.

No additional 24 VDC fusing is to be provided.

For cable type between terminal groupings and analog input PLC cards, reference Section 2.4.F.

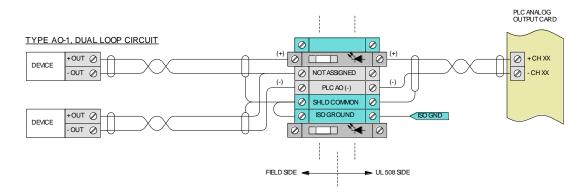
- 4. Analog Output, 5-Terminal Connection Methods
 - a. Field Connection **TYPE AO-1**, connection to a single field device

The Figure below shows the method of connecting a PLC analog output to a single field device using a 5-terminal standard analog output terminal group.



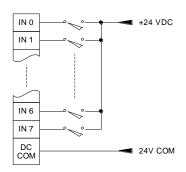
b. Field Connection **TYPE AO-2**, connection to two field devices

The Figure below shows the method of connecting a PLC analog output to two field devices using a 5-terminal standard analog output terminal group. These devices can be loop-powered or device powered.



- 5. Digital Input, Termination and Connectivity
 - a. Digital Input Type

All digital inputs shall be the "sinking" type as shown below. Reference Specification Section 13450, Programmable Logic Controller (PLC) Hardware.



1/2 OF 24 VDC, 16 CHANNEL PLC DIGITAL SINKING INPUT CIRCUIT

b. Digital Input Fusing to Field Circuits

Provide fusing for each field-connected digital input. A single fuse shall be used for a group of field inputs from a common remote panel providing that the inputs are connected to the same input card. A common fuse shall not be used for separate cards.

Separate fuses shall be provided for field inputs that are not terminated in a common remote panel.

Provide a separate fuse for each set of 4 unassigned (spare) Digital Inputs.

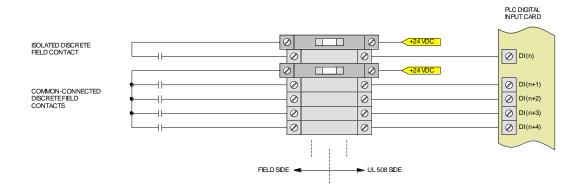
Fuses shall be 0.5 Amp.

Provide a separate gray feedthrough terminal for each digital input channel whether the input channel is assigned or unassigned.

c. Digital Input Connection Methods

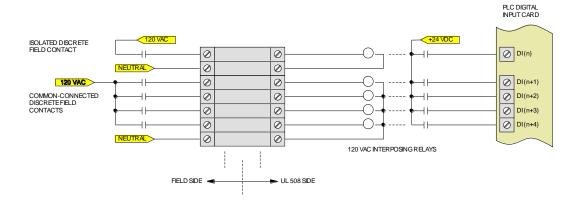
i. Connections to "Dry" Field Contacts

Discrete input field devices with dry Form A or Form B contacts sharing a common cabinet or piece of equipment may be combined into a group sharing a single +24 VDC fused common as shown below.



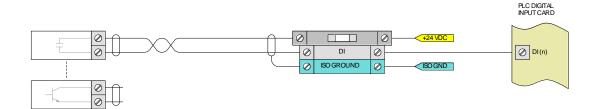
ii. Connections to "Hot" (wet) 120 VAC Field Circuits

Digital inputs derived from 120 VAC "hot" circuits shall be buffered through interposing relays inside the PLC control panel prior to connection to the 24 VDC Digital Input PLC cards in a manner shown in the Figure below. Reference "PLC 120 VAC - to - 24 VDC Input Buffer Relays" in Section 2.2 for relay product type.



iii. Digital Pulse Inputs

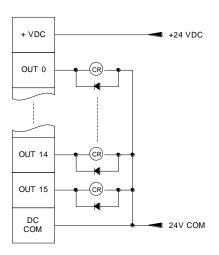
Digital pulse inputs shall be either dry Form A or Form B contacts or active open-collector circuits as shown in the Figure below. The +24 VDC power shall be provided by the 24 VDC control system power and shall be separately fused.



6. DIGITAL OUTPUT, Termination and Connectivity

a. Digital Output Type

All digital outputs shall be the "sourcing" type as shown below. Reference Specification 13450, Programmable Logic Controller (PLC) Hardware.



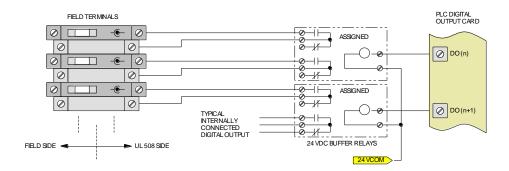
24 VDC, 16 CHANNEL PLC DIGITAL SOURCING OUTPUT CIRCUIT

b. Digital Output Buffer Relays

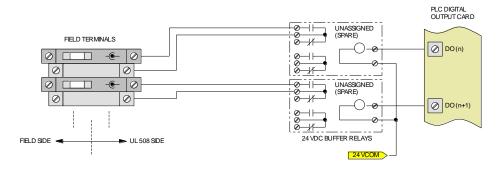
All 24 VDC digital outputs, even if unassigned (spare), shall be buffered through a DPDT (minimum) interposing relay prior to being connected to other internal circuits or field terminals. 4PDT relays shall be provided where shown on wiring diagrams. Reference "PLC 24 VDC Output Buffer Relays" in Part 2 for product type.

Internally connected buffered outputs shall not be fused.

Assigned digital outputs shall be assigned to single or double fused output terminal pairs as shown in the Figure below.



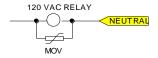
All unassigned digital outputs shall be buffered to a single fused output terminal pair as shown in the Figure below.



F. RELAY COIL SURGE SUPPRESSION

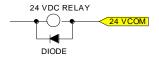
1. 120 VAC Coil Surge Suppression

All 120 VAC coils shall be paralleled by a Metal Oxide Varistor (MOV) type surge suppressor as shown in the Figure below. The suppressor shall be connected directly across the relay socket coil terminals with short wire leads.



2. 24 VDC Coil Surge Suppression

All 24 VDC coils shall be paralleled by a reverse-connected shunt diode as shown in the Figure below. The diode shall be connected directly across the relay socket coil terminals with short wire leads. The diode shall be rated at 1A, 100 PIV minimum.



3.2 SOURCE QUALITY CONTROL

- A. Submit a shop test plan indicating how the test will be conducted, and how the system will be verified.
- B. Revise all plans upon completion of the work to show the "as shipped" condition of the panel.
- C. Allow for the owner and Engineer to witness the shop test. Provide a minimum of 15-days notice prior to the test.
- D. Provide a shop test after factory completion and prior to shipment.

1. Test Documentation

- a. Provide a testing procedure and submit to the Engineer at least 1 week prior to the shop test.
- b. Document all required corrections, even those that may be remedied during the shop test.
- c. Issue a copy of the test procedures and necessary corrections to the General Contractor and the Engineer.
- d. Make all necessary corrections before shipping any panels, equipment, or devices to the job site.
- e. Issue a final signed document verifying that each correction has been made.

2. PLC Control Test

- a. Conduct a burn-in period (minimum of 2 days) where the system is operated continuously and checked for proper operation.
- Utilize simulated I/Os to verify proper operation.
 Demonstrate the operation of each digital and analog I/O point.

- c. Demonstrate compete connectivity and data transfer over the process control network. Verify the operation of all motor starters and remote devices monitored and controlled over the network.
- d. Provide a computer and the software required for testing such that the owner may view the simulation of operator entries of field parameters such as set points and alarm values during the test.

3. Relay and Process Controller Test

a. Demonstrate the complete operation of the relay logic, backup logic, process controllers, and etc.

4. Motor Starter Test

- a. Demonstrate the complete operation of all motor starters. Connect a portable motor to each starter and operate the motor in HAND, OFF, and AUTO modes. Demonstrate the proper operation of all motor safety interlocks.
- b. Preprogram all motor starter Human Interface Modules (HIMs) for compliance with motor manufacturer's protection criteria and compliance with the design engineer's control requirements.

5. Other Tests

- a. Provide normal operating voltage to all equipment.
 Demonstrate the operation of all equipment while under power.
- b. The entire assembled panel shall be tested to be free from grounds and shorts.
- c. Controllers, circuits and interlocks shall be rung out and tested to assure that they function correctly before the panel is shipped.

3.3 INSTALLATION

- A. Install freestanding panels on concrete housekeeping pads.
- B. Anchor panels rigidly in place with approved anchorage devices. If mounting details are shown on the Plans, then these methods shall be used.

*** END OF SECTION ***

PART 5 WAGE RATES

PART 6 APPENDICES

APPENDIX A SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA

APPENDIX A

SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA FORMS MANZANITA RESERVOIR AND BOOSTER PUMP STATION

These forms shall be completed in their entirety and submitted by the apparent two lowest Bidders to the Mason County PUD No. 1 by 12:00 p.m. (noon) of the second business day following the bid submittal deadline.

Failure to submit and meet the requirements as stated in Section 2.01.8 of the General Conditions shall be grounds for rejection of the bid. The Mason County PUD No. 1 will be the sole judge in determining if the prospective contractor meets the minimum experience requirements.

Cont	tractor:						
Nam							
Phor							
Con	tact Pers	son:					
2.	Deli	nquent State Taxes					
	Instr	uctions to Bidders: Check the appropriate box					
		The Bidder <u>does not</u> owe delinquent taxes to the Washington State Department of Revenue.					
		Alternatively, the Bidder <u>does</u> owe delinquent taxes to the Washington State Department of Revenue.					
		e Bidder owes delinquent taxes, they must submit a written payment plan oved by the Department of Revenue, to the Contracting Agency.					
	(Dat	e) (Signature)					
		(Print Name)					
		(Title)					

3. **Subcontractor Responsibility:** Instructions to Bidders: Check all boxes that apply The Bidder's standard subcontract form includes the subcontractor responsibility language required by RCW 39.06.020. The Bidder has a procedure for validating the responsibility of subcontractors with which the Bidder contracts. The Bidder's subcontract form includes a requirement that each of its subcontractors shall have and document a similar procedure to determine whether the sub-tier subcontractors with whom it contracts are also "responsible" subcontractors as defined by RCW 39.06.020. If the Bidder is unable to check all of the above boxes, provide an explanation as to how the bidder will comply with RCW 39.06.020. (Signature) (Date) (Print Name)

(Title)

Claims Against Retainage and Bonds: Instructions to Bidders: Check the appropriate box The Bidder has not had claims against retainage and bonds in the 3 years prior to the bid submittal date. Alternatively, the Bidder has had claims against retainage and bonds in the П 3 years prior to the bid submittal date. If the Bidder has had claims against retainage and bonds in the 3 years prior to the bid submittal date, submit a list of public works projects completed during this period that have had claims against retainage and bonds and include name of Project, contact information for the Owner, a list of claims filed against retainage and/or payment bond for any of the projects listed; and a written explanation of circumstances surrounding each claim and the ultimate resolution of the claim. (Signature) (Date) (Print Name) (Title)

4.

Public Bidding Crime: Instructions to Bidders: Check the appropriate box The undersigned certifies that the Bidder and/or its Owners have not been convicted of a crime involving bidding on a public works contract in the 5 years prior to the bid submittal date. Alternatively, the undersigned confirms that the Bidder and/or its Owners have been convicted of a crime involving bidding on a public works contract in the 5 years prior to the bid submittal date. If the Bidder and/or its Owners have been convicted of a crime involving bidding on a public works contract, provide a written explanation identifying the date of the conviction and a description of the circumstances surrounding the conviction. (Date) (Signature) (Print Name) (Title)

5.

6. **Termination for Cause/Termination for Default** Instructions to Bidders: Check the appropriate box The undersigned certifies that the Bidder has not had any public works contracts terminated for cause or terminated for default by a government agency in the 5 years prior to the bid submittal date. Alternatively, the undersigned confirms that the Bidder has had public works contracts terminated for cause or terminated for default by a government agency in the 5 years prior to the bid submittal date. If the Bidder has had any public works contracts terminated for cause or terminated for default in the 5 years prior to the bid submittal date, provide a written explanation for all contracts terminated for cause or terminated for default by identifying the project contract that was terminated, the government agency which terminated the Contract, the date of the termination, and a description of the circumstances surrounding the termination. (Signature) (Date) (Print Name)

(Title)

7. Lawsuits Instructions to Bidders: Check the appropriate box The undersigned certifies that the Bidder has not had any lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts. Alternatively, the undersigned confirms that the Bidder has had any lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts. If the Bidder has had any lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, submit a list of lawsuits along with a written explanation of the circumstances surrounding each lawsuit. The Contracting Agency shall evaluate these explanations to determine whether the lawsuits demonstrate a pattern of failing to meet the terms of contracts. (Signature) (Date) (Print Name)

(Title)

Contract Time (Liquidated Damages) Instructions to Bidders: Check the appropriate box The undersigned certifies that the Bidder has not had liquidated damages assessed on any project it has completed in the 5 years prior to the bid submittal date. Alternatively, the undersigned confirms that the Bidder has had liquidated damages assessed on projects in the 5 years prior to the bid submittal date. If the Bidder has had liquidated damages assessed against projects in the 5 years prior to the bid submittal dated, submit a list of projects along with Owner contact information, and number of days assessed liquidated damages. The Contracting Agency shall determine whether the Contractor has a pattern of failing to complete projects within Contract Time. (Signature) (Date) (Print Name) (Title)

8.

9. Capacity and Experience

Capacity

A.

The Bidder shall have sufficient current capacity and the Project Superintendent assigned to the Project shall have experience to meet the requirements of this Project. The Bidder and Project Superintendent shall have successfully completed at least two projects as the prime contractor, of a similar size and scope, during the 5-year period immediately preceding the bid submittal deadline for this project. Similar size is defined as a minimum of 70 percent of the bid amount submitted by the Bidder.

Gro	oss dollar amount of work currently under contract:
Gro	oss dollar amount of contracts currently not completed:
on	t five major pieces of equipment which are anticipated to be this project by the Contractor and note which items are owne Contractor and which are to be leased or rented from others
_ Nu	mber of superintendents on Bidder's staff:

B.	Exper	nce	
	i.	General character of work performed by firm:	
	ii.	Identify who will be the superintendent on this project and years of experience. Also, list the number of years this person has been wit your firm.	
	iii.	Similar Size and Scope Projects Completed in the Past 5 Years	
		#1 Owner's Name and Contact Information:	_
		Owner is a Government Agency? Yes No Superintendent's Name: Project Name:	
		Awarded Contract Amount:	
		Final Contract Amount:	
		Completion Date:	_
		Project Description:	_
			_
			_
			_

Owner is a Government Agency?	Yes _	N
Superintendent's Name:		
Project Name:		
Awarded Contract Amount:		
Final Contract Amount:		
Completion Date:		
Project Description:		
Owner's Name and Contact Informa		
Owner's Name and Contact Informa		
Owner's Name and Contact Informa		
	ition:	
Owner is a Government Agency?	tion:	No
Owner is a Government Agency? Superintendent's Name:	Yes	No
Owner is a Government Agency? Superintendent's Name: Project Name:	tion:Yes _	No
Owner is a Government Agency? Superintendent's Name: Project Name: Awarded Contract Amount:	Yes	N
Owner is a Government Agency? Superintendent's Name: Project Name:	Yes	N

APPENDIX B

PROJECT APPRENTICE COMPLIANCE DOCUMENTATION

Apprentice Utilization Good Faith Efforts Documentation

Project:	Date:
Prime:	
Prepared By (print name and title):	
Requested apprentice utilization percentage (goal adjustm	nent):
Contractor Statement	
An adjustment to the apprentice utilization requirements for the hereby requested. All contractors and subcontractors on the prequirements, have performed the following documented good confirmed that the required apprentice utilization hours will not for the <i>following rationale</i> (initial)	oject understand the faith efforts, and have
Rationale. Check all that apply.	
□ Demonstrated lack of availability of apprentices (regionally o	r by trade). [list trades]
☐ Disproportionately high ratio of material/product/equipment of	cost to labor.
$\hfill \square$ Not enough hours available on the job to accommodate the process required.	ratio, supervision, or work
☐ State approved apprentice programs unavailable for the spec	cific work type.
□ Warranty or specialty work requirements unable to accommo	odate apprentices.
☐ Funding requires federal, native American, or other employer conflicts with Washington State apprentice utilization requirements.	0. 0
□ Other:	,
in)	(fill

Documentation must be attached to substantiate the request. Check all that apply and attach.
□ Emails, letters, or similar communication with appropriate state apprenticeship program confirming the assessment or denying apprentices or similar. Include, dates, time, responses, names, titles, and similar information.
☐ Manufacturer letter or email statement of equipment, material, or product that substantiates the cost and/or the specialty nature or the item and the requirement for certified/specific installers or similar.
□ Specification section , funding requirement, or similar precluding or hindering state apprentice utilization requirements.
□ Other:
in)
☐ Attach a revised Apprentice Utilization Plan showing where adjustments are
requested.

PROJECT APPRENTICE UTILIZATION PLAN

Project Name and No.	AUR	15%
Prime Contractor Name		
Initial Date Submitted	Revision No.	
Submitted By	Revision Date	

^{*} Include labor hours and count for all trades, including those performed by Subcontractors. Mark all revisions in RED.

Part A

	Program/Trade	No.	Name	Estimated Journey	Estimated
Prime				Level Hours	Apprentice Hours
		Tota			

Part B

Subcontractor	Estimated	Program/Trade	Name	No.	Estimated	Estimated
business name	Start Date				Journey Level	Apprentice
					Hours	Hours
Total Estimated Hours Part B						
Total Estimated Hours Part A (from above)						
Total appr	entice utilization	on percentage based o	n planned values			

Reviewed by:	Date:
Good faith efforts needed*? ☐yes ☐no	

*If the estimated total apprentice utilization percentage is under 15%, **good faith efforts** must be made.

<u>Use separate form to document. A revised Apprentice Utilization Plan is to be attached to every good faith</u> <u>effort AUR adjustment request.</u>

- The owner reserves the right to request additional documentation or information to verify subcontractors, scope, trade, and/or hours of work.
- Those projects that do not meet the apprentice utilization goal (approved goal adjustments meet the goal) shall be assessed a penalty per the contract documents.

APPENDIX C

BORING LOGS (FOR INFORMATION ONLY)

The locations of all features shown are approximate.

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: CAD File from Mason County PUD No. 1 received on 05/02/2022.

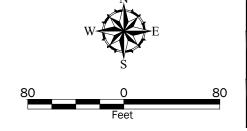
Substation Layout provided by Mason PUD No. 1 on 04/19/2022.

Aerial from Google Earth Pro dated 06/27/2021.

Projection: Washington State Plane, South Zone, NAD83, US Foot

Legend

B-1 Boring by GeoEngineers, Inc., 2022



Site Plan

Mason PUD 1 - Manzanita Substation Union, Washington



Figure 2

APPENDIX A Subsurface Explorations and Laboratory Testing

APPENDIX A SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

Subsurface Explorations

Subsurface conditions for the proposed Manzanita Substation project were explored by advancing six hollow-stem auger borings on April 29, 2022. Subsurface exploratory services were provided by Holocene Drilling, Inc. under subcontract to GeoEngineers, Inc. The borings were advanced to depths ranging from $10\frac{1}{2}$ to 21 feet below ground surface (bgs).

The approximate locations of the borings were determined using a tablet equipped with GPS software and/or pacing off from existing site features. The exploration locations are included on the Site Plan, Figure 2. The location and elevation of each exploration should be considered approximate.

Our field representative collected samples, classified the soils, maintained a detailed log of each exploration, and observed groundwater conditions. The samples were obtained with a standard split spoon sampler in general accordance with ASTM International (ASTM) D 1586. Field blow counts are presented on the log. The soils were classified visually in general accordance with the system described in Figure A-1, which includes a key to the exploration logs. Summary logs of the explorations are included as Figures A-2 through A-7.

The densities noted on the boring exploration logs are based on the blow counts produced in the SPT and our experience and judgment. The logs are based on our interpretation of the field and laboratory data and indicate the depth at which we interpret subsurface materials or their characteristics to change, although these changes might actually be gradual.

Observations of groundwater conditions were made during drilling and are presented on the boring logs. Groundwater conditions observed during drilling represent a short-term condition and may or may not be representative of the long-term groundwater conditions at the site. Groundwater conditions observed during drilling should be considered approximate.

Laboratory Testing

Soil samples obtained from the explorations were transported to GeoEngineers' laboratory. Representative soil samples were selected for laboratory tests to evaluate the pertinent geotechnical engineering characteristics of the site soils and to confirm our field classifications.

Our testing program consisted of the following:

- Five grain-size distribution analyses (sieve analysis [SA])
- One percent fines determination (%F)
- Five moisture content determinations (MC)
- One DIPRA 10-point test



Tests were performed in general accordance with test methods of ASTM International (ASTM) or other applicable procedures. The following sections provide a general description of the tests performed.

Sieve Analysis (SA)

Grain-size distribution analyses were completed on selected samples in general accordance with ASTM Test Method C 136. This test method covers the quantitative determination of the distribution of particle sizes in soils. Typically, the distribution of particle sizes larger than 75 micrometers (µm) is determined by sieving. The results of the tests were used to verify field soil classifications and determine pertinent engineering characteristics. Figures A-8 and A-9 present the results of our sieve analyses.

Percent Fines (%F)

A selected sample from boring B-6 was "washed" through the U.S. No. 200 sieve to estimate 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 (75 μ m). The test was conducted in general accordance with ASTM D 1140. Test results are used to aid in soil classification and correlation with other pertinent engineering soil properties and are presented on the boring log at the respective sample depth.

Moisture Content (MC)

The moisture content of selected samples was determined in general accordance with ASTM Test Method D 2216. The test results are used to aid in soil classification and correlation with other pertinent engineering soil properties. The results are presented on the boring logs at the depth tested.

DIPRA 10-Point Test

The soil corrosivity was evaluated for the drill cuttings obtained in the upper approximate 10 feet of existing grade for boring B-3. A DIPRA 10-point test was performed on the sample in general accordance with ANSI/ANSW C105/A21.5. The results of the test is provided in Figure A-10. The test results are typically used to evaluate corrosivity to ductile iron pipe, the potential for corrosion may differ for thin-walled steel pipe.



SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL	
MAJOR DIVISIONS			GRAPH	LETTER	DESCRIPTIONS	
	GRAVEL	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES	
	AND GRAVELLY SOILS	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES	
COARSE GRAINED SOILS	MORE THAN 50% OF COARSE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
SOILS	FRACTION RETAINED ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
MORE THAN 50%	SAND	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS	
RETAINED ON NO. 200 SIEVE	AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND	
		SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES	
	ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		sc	CLAYEY SANDS, SAND - CLAY MIXTURES	
	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY	
FINE GRAINED				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
SOILS				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
MORE THAN 50% PASSING NO. 200 SIEVE				МН	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS	
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		СН	INORGANIC CLAYS OF HIGH PLASTICITY	
				ОН	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY	
	HIGHLY ORGANIC S	SOILS		PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

2.4-inch I.D. split barrel / Dames & Moore (D&M)
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.

ADDITIONAL MATERIAL SYMBOLS

SYM	BOLS	TYPICAL
GRAPH	LETTER	DESCRIPTIONS
	AC	Asphalt Concrete
	СС	Cement Concrete
13	CR	Crushed Rock/ Quarry Spalls
7 71 71 71 71 71 71 71 71 71 71 71 71 71	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Ī

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

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
Pl Plasticity index

PL Point lead test
PP Pocket penetrometer
SA Sieve analysis
TX Triaxial compression

UC Unconfined compression

UU Unconsolidated undrained triaxial compression

VS Vane shear

Sheen Classification

NS No Visible Sheen SS Slight Sheen MS Moderate Sheen HS Heavy Sheen

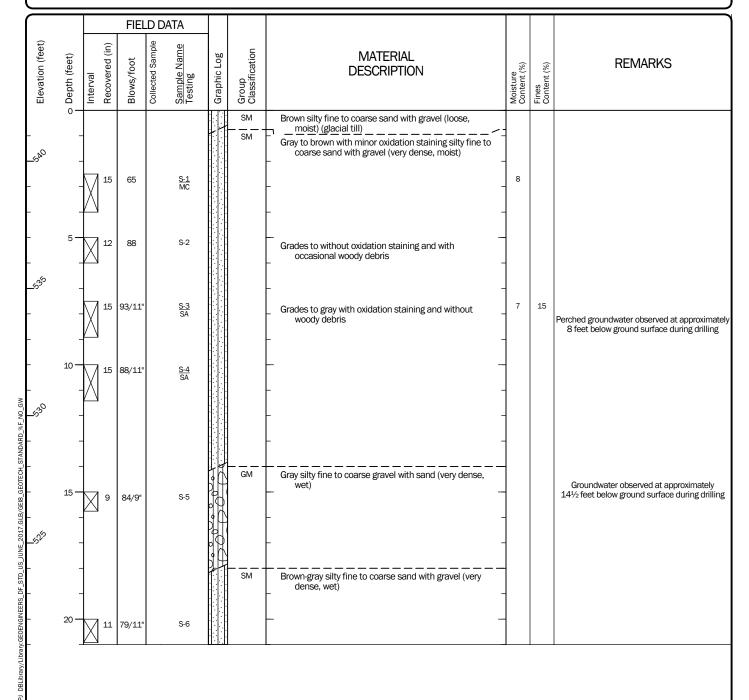
NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs



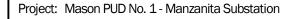
Figure A-1

Start Drilled 4/29/20:	<u>End</u> 22 4/29/2022	Total Depth (ft)	21	Logged By Checked By	OA CRN	Driller Holocene Acquisition Company, LLC		Drilling Method Hollow-stem Auger			
Surface Elevation Vertical Datum		542 NAVD88			140	Autohammer O (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo (track-mounted)			
Easting (X) Northing (Y)	998270 740310			System Datum	WA	A State Plane South NAD83 (feet)	See "Remark	ks" section for groundwater observed			
Notes: Samples:	Notes: Samples S-3 and S-4 combined for sieve analysis.										



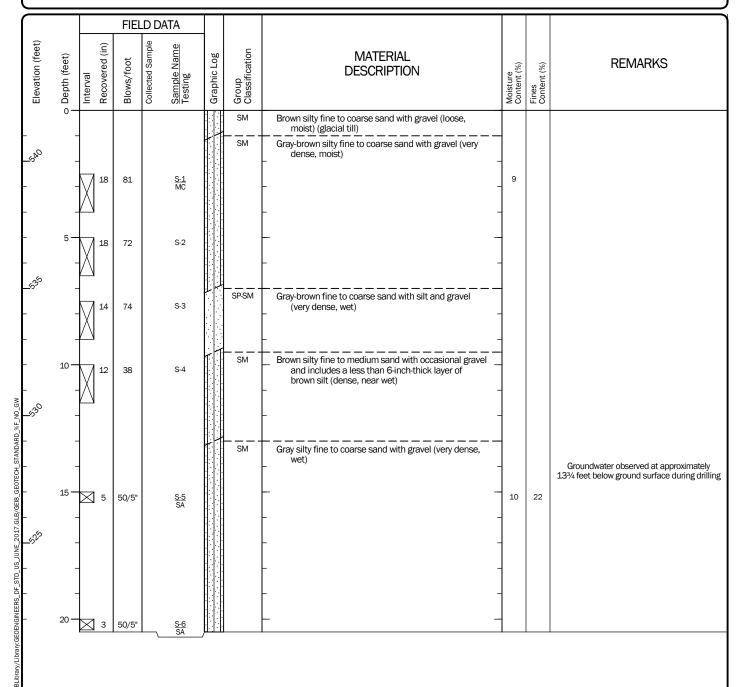
 $Note: See \ Figure \ A-1 \ for \ explanation \ of \ symbols.$ $Coordinates \ Data \ Source: \ Horizontal \ approximated \ based \ on \ Google \ Earth. \ Vertical \ approximated \ based \ on \ Other.$





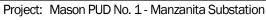


Start Drilled 4/29/20	<u>End</u> 22 4/29/2022	Total Depth (ft)	20.5	Logged By Checked By	OA CRN	Driller Holocene Acquisition Company, LLC		Drilling Method Hollow-stem Auger			
Surface Elevation Vertical Datum) 542 NAVD88			140	Autohammer O (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo (track-mounted)			
Easting (X) Northing (Y)	998160 740390			System Datum	WA	A State Plane South NAD83 (feet)	See "Remark	ks" section for groundwater observed			
Notes: Samples	Notes: Samples S-5 and S-6 combined for sieve analysis.										



 $Note: See \ Figure \ A-1 \ for \ explanation \ of \ symbols.$ $Coordinates \ Data \ Source: \ Horizontal \ approximated \ based \ on \ Google \ Earth. \ Vertical \ approximated \ based \ on \ Other.$





Project Location: Union, Washington Project Number: 16325-002-00



Figure A-3 Sheet 1 of 1

Drilled 4/	<u>Start</u> /29/2022	<u>End</u> 4/29/2022	Total Depth (ft)	15.5	Logged By Checked By	OA CRN	Driller Holocene Acquisition Company, LLC		Drilling Method Hollow-stem Auger		
Surface Ele Vertical Dat		(ft) 548 NAVD88			Hammer Data	140	Autohammer 0 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo (track-mounted)		
Easting (X) Northing (Y					System Datum	WA	State Plane South NAD83 (feet)	Groundwate	r not observed at time of exploration		
Notes: Sa	Notes: Samples S-3 and S-4 combined for sieve analysis.										

			FIEL	D D	ATA						
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
-	0 -					,/	SM SM	Brown sitty fine to coarse sand with gravel (loose, moist) (glacial till) Gray-brown with heavy oxidation staining silty fine to coarse sand with gravel (very dense, moist)			Grab sample collected from upper 10 feet of drill cuttings for 10-pt. DIPRA test (S-1A)
_6 ⁴⁵	-	8	78/11"	ı	<u>S-1B</u> MC			- -	8		Moderate drill chatter at approximately 4 feet
-	5 —	10	63		S-2			Grades to gray and without oxidation staining			below ground surface
- _540	-	8	70/11"		<u>S-3</u> SA	3000	GM	Gray sity fine gravel with sand (very dense, moist)	8	32	
- I I	10 —	18	62		<u>S-4</u> SA			- - -			Moderate drill chatter at approximately 10 feet below ground surface
LSTANDARD_%F_NO_	-							- - -			
EIB_GEOTECH	15 —		50/6"		S-5						
y/Likrary.GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GERB_GEOTECH_STANDARD_%F_NO_GW 											





Project: Mason PUD No. 1 - Manzanita Substation

Drilled 4	<u>Start</u> 4/29/2022	<u>End</u> 4/29/2022	Total Depth (ft)	11.5	Logged By Checked By	OA CRN	Driller Holocene Acquisition Company, LLC		Drilling Hollow-stem Auger		
Surface E Vertical D	Elevation (ft) Datum	n (ft) 543 NAVD88			Hammer Data	mer Autohammer 140 (lbs) / 30 (in) Drop			Diedrich D50 Turbo (track-mounted)		
Easting (X Northing (System Datum	WA	A State Plane South NAD83 (feet)	Groundwate	er not observed at time of exploration		
Notes: S	Notes: Samples S-3 and S-4 combined for sieve analysis.										

\bigcap			FIEL	D D	ATA						
Elevation (feet)		Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
-	0 —						SM	Brown silty fine to coarse sand with gravel (loose, moist) (glacial till) Gray-brown silty fine to coarse sand with gravel (very dense, moist)			
_54 ⁰	_	17	80/11"		<u>S-1</u> MC			- -	12		
-	5 —	18	70		\$-2			- -			
- - - -	-	14	81		<u>S-3</u> SA			- - -	7	27	
- - M5.	10 —	17	92/11"		<u>S-4</u> SA						



Log of Boring B-4

Project: Mason PUD No. 1 - Manzanita Substation

Drilled	<u>Start</u> 4/29/2022	<u>End</u> 4/29/2022	Total Depth (ft)	11	Logged By Checked By	OA CRN	Driller Holocene Acquisition Company, LLC		Drilling Method Hollow-stem Auger		
Surface Vertical	Elevation (ft) Datum	on (ft) 542 Hammer Autohammer NAVD88 Data 140 (lbs) / 30 (in) Drop					Drilling Equipment	Diedrich D50 Turbo (track-mounted)			
Easting Northing			7800 0410		System Datum	W	A State Plane South NAD83 (feet)	Groundwater not observed at time of exploration			
Notes:	Notes: Samples S-1 and S-2 combined for sieve analysis.										

\bigcap			FIEL	D D	ATA						
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	<u>Sample Name</u> Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0-					1:1	ML	Brown sandy silt with occasional gravel (medium stiff, moist) (glacial till)			
_5 ¹⁰	_							Gray-brown silty fine to coarse sand with gravel (very dense, moist)			
_	-	12	65		<u>S-1</u> SA				9	30	
-	-										
-	5—	12	68		<u>S-2</u> SA						
- -	-							-			Periodic minor drill chatter from approximately 6 feet below ground surface to termination depth
	_	1	50/6"		S-3						Gravel in sampler shoe
-	-										
	10 —	8	68/11"		S-4			_			



Log of Boring B-5

Project: Mason PUD No. 1 - Manzanita Substation

Start Drilled 4/29/2022	<u>End</u> 4/29/2022	Total Depth (ft)	10.5	Logged By Checked By	OA CRN	Driller Holocene Acquisition Company, LLC		Drilling Method Hollow-stem Auger
Surface Elevation (ft) Vertical Datum					140	Autohammer 0 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D50 Turbo (track-mounted)
Easting (X) Northing (Y)		7650 0370		System Datum	WA	State Plane South NAD83 (feet)	Groundwate	r not observed at time of exploration
Notes:								

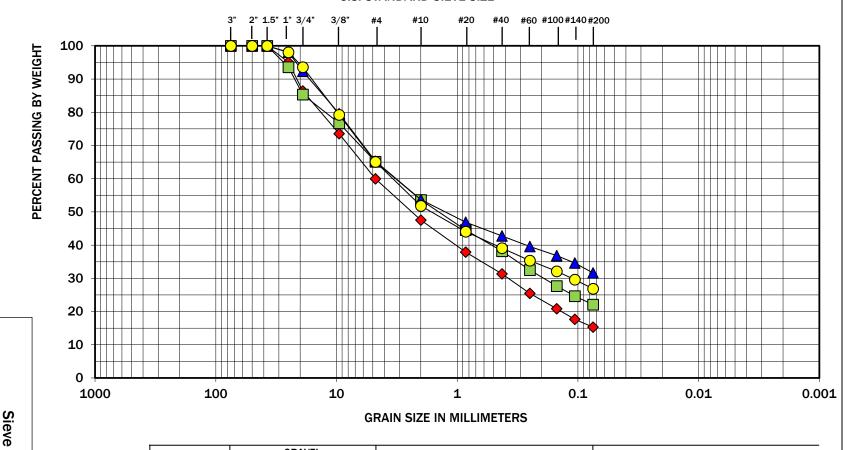
			FIEL	D D	ATA						
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
-	0-						ML	Brown sandy silt (medium stiff, moist) (glacial till) Gray-brown with minor oxidation staining silty fine to coarse sand with gravel and occasional organic matter (fine roots) (very dense, moist)			Heavy drill chatter from ½ foot to 2½ feet below ground surface
-	-	14	50		<u>S-1</u> MC			- -	10		
- - - - - - - - - - -	5 —	12	74/9"		S-2			_ Grades to gray and brown with moderate oxidation staining			Heavy drill chatter from 5 feet to 10 feet below ground surface
- -	-	8	88/10"		<u>S-3</u> %F			Grades to brown-gray without oxidation staining	6	21	Gravel in sampler shoe
_ ₆₃₀	10 —	3	50/6"		S-4			_	•		чичент заттры этос

Log of Boring B-6



Project: Mason PUD No. 1 - Manzanita Substation

U.S. STANDARD SIEVE SIZE



COBBLES	GR	AVEL		SAND		SILT OR CLAY
COBBLES	COARSE	FINE	COARSE	MEDIUM	FINE	SILI OR CLAY

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
•	B-1	7.5-10	7	Silty sand with gravel (SM)
	B-2	15-20	10	Silty sand with gravel (SM)
_	B-3	7.5-10	8	Silty gravel with sand (GM)
0	B-4	7.5-10	7	Silty sand with gravel (SM)

Note: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations, or generated by separate operations or processes.

The grain size analysis results were obtained in general accordance with ASTM C 136. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

0 П Z GINE RS

9

Mason PUD No. 1 Union, Washington -1 Manzanita Substation

Analysis

Results

AASHO

Figure A-8

U.S. STANDARD SIEVE SIZE 2" 1.5" 1" 3/4" 3/8" #10 #20 #40 #60 #100 #140 #200 100 PERCENT PASSING BY WEIGHT 90 80 70 60 50 40 30 20 9 10 Mason PUD П 0 0 П 100 10 1 0.1 0.01 0.001 1000

COBBLES	GR	AVEL		SAND		SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	SILI OR CLAY

GRAIN SIZE IN MILLIMETERS

	Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
	•	B-5	2.5-5	9	Silty sand with gravel (SM)
ام					

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The grain size analysis results were obtained in general accordance with ASTM C 136. GeoEngineers 17425 NE Union Hill Road Ste 250, Redmond, WA 98052

Z GINE RS

Sieve Analysis

Results

AASHO

No. 1

-1

Manzanita

Substation

Union, Washington

Figure A-9

DIPRA (Ductile Iron Pipe Research Association) 10 Point Soil Evaluation

Job Name:	Manzanita Substation	Job#:	16325-0	02-00
Date:	5/18/22	Tested by: AK		V
Boring #:	B-3			DIPRA Pts.
Sample #:	1A	Resistivity:	96000	0
Depth:	0-10	pH:	6.95	0
C-IDinti		Redox Potential:	380 MV	0
Soil Description:		Sulfides:	Trace	2
Sa	andy Silt (ML)	Moisture:	M	1
		Tota	al DIPRA Points:	3

DIPRA Point Scale
Resistivity (ohm-cm)
0 - 150010 pts
1500 - 18008 pts
1800 - 21005 pts
2100 - 25002 pts
2500 - 30001 pt
> 3000 0 pts
pH
0.0 - 2.05 pts.
2.0 - 4.03 pts.
4.0 - 8.5 0 pts
8.5 - 14.03 pts.
Redox Potential (millivolts)
>+100(mv) 0 pts
+50 to +100(mv)3.5 pts
0 to +50(mv)4 pts
Negative 5 pts
Sulfides
Positive3.5 pts
Trace 2 pts
Negative 0 pts
M.'.
Moisture
Poor (wet)
Fair (moist)
Good (dry) 0 pts
pH and Redox meters calibrated by: AKV

Date: 5/17/2022

Note: This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to the specific sample on which they were performed, and should not be interpreted as representative of any other samples obtained at other times, depths or locations, or generated by separate operations or processes.

DIPRA 10-Point Results

Mason PUD No. 1 – Manzanita Substation Union, Washington



Figure A-10

APPENDIX D PERMITS



INSPECTION CARD

Mason County 615 W. Alder St.

615 W. Alder St.
Building 8, Shelton, WA 98584
360-427-9670 ext 352
www.masoncountywa.gov

PERMIT #	BLD2024-0139	92		PROJECT ADDRESS		ESS	1681 E MCREAVY RD UNION, WA 98592				
PARCEL#	321053100000)		PROJECT DESCRIPTION			PROJECT DESCRIPTION DEMO SFR FOR CONSTRUCTION OF RESERVOIRA				ERVOIR/BOOSTER
OWNER	MASON CO PU	D #1		ADDRESS	MANAC	GER				PHONE	360-877-5249
CONTRACTOR	TRACTOR			ADDRESS			PHONE				
CONTRACTOR	LICENSE			LENDER							
INSPEC	CTION	INSP	DATE	Comments			INSPECTION	INSP	DATE		Comments
Connection is to	be verified by					Demolition	Final Inspection				



Mason County

Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

ISSUED: 12/03/2024

EXPIRES: 06/01/2025

BLD2024-01392 DEMO

OWNER:

PROJECT DESCRIPTION: DEMO SFR FOR CONSTRUCTION OF

RESERVOIR/BOOSTER STATION

SITE ADDRESS: 1681 E MCREAVY RD UNION

PARCEL: 321053100000

APPLICANT: MASON CO PUD #1

MANAGER

SHELTON, WA 98584

360-877-5249

OWNER'S REP: GRAY & OSBORNE ENGINEERING

2102 CARRIAGE ST SW SUITE 1

OLYMPIA, WA 98502 1.360.292.7481

FEES:	<u>Paid</u>	<u>Due</u>
Technology Flat Convenience Fee	\$5.00	\$0.00
Demolition Fee	\$131.00	\$0.00
State Fee-Residential	\$6.50	\$0.00

\$142.50

Totals:

MASON CO PUD #1

SHELTON, WA 98584

MANAGER

REQUIRED INSPECTIONS

Connection is to be verified by Health or Utilities

Demolition Final Inspection

CONDITIONS

\$0.00

^{*} For public safety, it is the responsibility of the applicant to confirm through written verification all utility services (electric, gas, water, sewer, ...) have been terminated prior to demolishing a structure.

^{*} All building permits shall have a final inspection performed and approved by Mason County Building Department prior to permit expiration. The failure to request a final inspection or to obtain approval will be documented in the legal property records on file with Mason County as being non-compliant with Mason County ordinances and building regulations.

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Mason County

Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

DEMO BLD2024-01392

- * OWNER / BUILDER acknowledges submission of inaccurate information may result in a stop work order or permit revocation. Acknowledgement of such is by signature below. I declare that I am the owner, owners legal representative, or contractor. I further declare that I am entitled to receive this permit and to do the work as proposed. I have obtained permission from all the necessary parties, including any easement holder or parties of interest regarding this project. The owner or authorized agent represents that the information provided is accurate and grants employees of Mason County access to the above described property and structure(s) for review and inspection. This permit/application becomes null & void if work or authorized construction is not commenced within 180 days or if construction work is suspended for a period of 180 days. PROOF OF CONTINUATION OF WORK IS BY MEANS OF INSPECTION. INACTIVITY OF THIS PERMIT APPLICATION OF 180 DAYS WILL INVALIDATE THE APPLICATION UNLESS OTHERWISE APPROVED.
- * Proper erosion and sediment control practices must be used on the construction site and adjacent areas to prevent upland sediments from entering the aquatic environment. Erosion control measures must be in place prior to any clearing, grading, or construction. These control measures must be effective to prevent soil from being carried into surface water by stormwater runoff. Any discharge of sediment-laden runoff or other pollutants to waters of the state is in violation of state regulations. Any work in or adjacent to waterways that will adversely affect water quality must receive specific prior authorization from the Department of Ecology. Silt fencing, straw matting, etc. must be installed and maintained until seeding or upland vegetation has become established around all areas disturbed or newly created by construction activities.
- * All other necessary permits from Mason County, Washington State, Federal Agencies, and/or other agencies/groups that are required for this proposed development and construction must be obtained PRIOR TO DEVELOPMENT AND CONSTRUCTION.
- * The Washington State Clean Air Act prohibits the burning of any construction or demolition debris in an outdoor fire.
- * The demolition and disposal of demolition debris must meet requirements as per Mason County regulations. it is unlawful for any person to cause or allow the demolition (or major renovation) of any structure unless all asbestos containing materials have been removed from the area to be demolished. work shall not commence on an asbestos project or demolition unless the owner or operator has obtained written approval from ORCAA @ 2490 B Limited Lane NW, Olympia WA 98502, 360-586-1044, 800-422-5623, www.orcaa.org
- * All construction debris must be removed from the site after project completion to an approved location. Proper disposal of construction debris must be on land in such a manner that debris cannot enter or cause water quality degradation of aquatic environments.

I hereby certify that I have read and examined this application and know the same to be true and correct. All provisions of Laws and Ordinances governing this type of work will be complied with whether specified herein or not. The granting of a permit does not presume to give authority to violate or cancel the provisions of any other state/local law regulating construction or the performance of construction.					
Issued By:					
Contractor or Authorized Agent:	Date:				



615 W. Alder St. Bldg 8, SHELTON, WA 98584

SHELTON: 360-427-9670, EXT 352 BELFAIR: 360-275-4467, EXT 352

> ELMA: 360-482-5269, EXT 352 www.co.mason.wa.us

INSPECTION CARD AND CERTIFICATE OF OCCUPANCY** To schedule an inspection call or visit http://www.co.mason.wa.us/community-services/bld-inspection.php

Permit Number GRD2024-00005 Date Issued 01/23/2025 Issued By

Project GRADING PERMIT FOR NEW WATER RESERVIOURS & BOOSER PUMP STATION

Site Address Applicant MASON CO PUD #1

Contractor

Contractor Phone

- -APPROVED PLANS MUST BE ONSITE FOR ALL INSPECTIONS.
- -DO NOT PROCEED BEYOND EACH STAGE OR COVER WORK UNTIL APPROVAL IS GRANTED.
- -THIS CARD MUST BE POSTED IN A CONSPICUOUS LOCATION, FRONT OF THE PREMISES IS BEST FOR MAKING ENTRY.
- -ALL PERMITS EXPIRE 180 DAYS AFTER THE PERMIT IS ISSUED OR 180 DAYS AFTER DATE OF LAST INSPECTION.
- -OWNER/AGENT IS RESPONSIBLE FOR REQUESTING ALL INSPECTIONS THROUGH FINAL INSPECTION.

THIS STRUCTURE MAY NOT BE USED OR OCCUPIED UNTIL ALL APPROVALS ARE GRANTED.
PRIOR TO CALLING FOR FINAL INSPECTION, ALL CONDITIONS OF THE PERMIT MUST BE MET

Public Works	Access/Driveway	Other
Health Deptartment	Septic	Well
Planning Department	Site Inspection	
Fire Marshall	Fire Apparatus Access	Fire Sprinkler
	Auto Fire Alarm	Hood and Duct
	Other	Final
Building Department	Building Official:	Community Services Designee
Concrete	Setbacks	Slab
	Footing Perimeter	Point load Footing
	Footing Interior	Footing Decks / Porches
	Foundation Stem Walls	Other
Rough-In	Groundwork Plumbing	Framing
	Groundwork Mechanical	Plumbing
	Groundwork Gas Pipe	Mechanical
	Gas Piping	Shear Wall Nailing
	Underfloor	
	Other	
Insulation	Slab	Ceiling
	Floor	Vaulted Ceiling
	Walls	Vapor Barrier
	Other	
Wallboard Nailing	Interior Wall Brace Panels	Fire Walls
	Other	
Final B	Building	
Manufactured Home	Setbacks	Setup
	Concrete Foot / Runners	Final
	Other	



Mason County

Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

ISSUED: 01/23/2025

EXPIRES: 07/22/2025

GRD2024-00005 GRADING

OWNER:

PROJECT DESCRIPTION: GRADING PERMIT FOR NEW WATER

RESERVIOURS & BOOSER PUMP STATION SITE ADDRESS: 1681 E MCREAVY RD UNION

PARCEL: 321053100000

APPLICANT: MASON CO PUD #1

MANAGER

SHELTON, WA 98584

360-877-5249

OWNER'S REP: GRAY & OSBORNE ENGINEERING

2102 CARRIAGE ST SW SUITE 1

OLYMPIA, WA 98502 1.360.292.7481

FEES:	<u>Paid</u>	<u>Due</u>
Planning Commercial Review Fee	\$450.00	\$0.00
Planning Stormwater Review	\$300.00	\$0.00
Grading Plan Review Fees	\$291.00	\$0.00
Grading Permit Fee	\$345.00	\$0.00

MASON CO PUD #1

SHELTON, WA 98584

MANAGER

Totals: \$1,386.00 \$0.00

REQUIRED INSPECTIONS

3rd Party Inspection Report

BLD-Final Inspection

CONDITIONS

^{*} Access Roads to the site must not be degraded as a result of work.

^{*} ALL CLEARING, CUTTING, GRADING, EXCAVATING, TERRACING, FILLING AND SIMILIAR WORK WILL BE REGULATED BY THE REQUIREMENTS PURSUANT TO THE MASON COUNTY GRADING PERMIT STANDARDS ADOPTED BY RESOLUTION 141-96 and MASON COUNTY CODE, TITLE 14, CHAPTER 14.44.

Now COM

Mason County

Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

GRADING GRD2024-00005

- * All other necessary permits from Mason County, Washington State, Federal Agencies, and/or other agencies/groups that are required for this proposed development and construction must be obtained PRIOR TO DEVELOPMENT AND CONSTRUCTION.
- * Provisions for surface/subsurface drainage control must be implemented with new construction or development on site and MUST NOT adversely impact adjacent parcels. Under the requirements of Mason County Stormwater Ordinance, either private ditches and drains will meet requirements of the stormwater ordinance or prior approval will be granted to use an existing utility and drainage easement dedicated for that specific purpose. For further information regarding this ordinance contact the Mason County Public Works Department prior to construction at Ext 450
- * OWNER / BUILDER acknowledges submission of inaccurate information may result in a stop work order or permit revocation. Acknowledgement of such is by signature below. I declare that I am the owner, owners legal representative, or contractor. I further declare that I am entitled to receive this permit and to do the work as proposed. I have obtained permission from all the necessary parties, including any easement holder or parties of interest regarding this project. The owner or authorized agent represents that the information provided is accurate and grants employees of Mason County access to the above described property and structure(s) for review and inspection. This permit/application becomes null & void if work or authorized construction is not commenced within 180 days or if construction work is suspended for a period of 180 days. PROOF OF CONTINUATION OF WORK IS BY MEANS OF INSPECTION. INACTIVITY OF THIS PERMIT APPLICATION OF 180 DAYS WILL INVALIDATE THE APPLICATION UNLESS OTHERWISE APPROVED.
- * Owner / Agent is responsible to post the assigned address and/ or purchase and post private road signs in accordance with Mason County Code 14.28 and 14.17.
- * All construction must meet or exceed all local and state ordinances in addition to the International Codes requirements as adopted and amended by Mason County and the State of Washington. Occupancy is limited to the approved and permitted classification. Any non-approved change of use or occupancy would result in permit revocation.
- * All RED stamped approved plans are required to be on-site for inspection purposes. If an inspection is called for and plans are not available on site, then approval will not be granted. In addition, a re-inspection fee (refer to current fee schedule, minimum 1 hour) will be charged and must be collected by the Building Department prior to any further inspections being performed or approvals granted.
- * All changes to "approved" building plans that effect compliance with the international codes as amended and adopted, or any other Mason County ordinance or regulation, must be reviewed and approved by Mason County prior to construction.
- * When parcel development requires direct access to county road(s), a Road Access Permit or Approval must be granted by the Mason County Department of Public Works. For any construction which is proposed to be located within 25' of a Mason County road right of way, it is suggested to contact that office to review future planned work which may affect your project. For more information contact Public Works, at (360) 427-9670, ext. 450 or 100 W Public Works Dr. Shelton. The building permit will not be finaled until the permit holder can show proof that the access permit from Public Works has been finaled and approved.
- * Any changes in proposed construction shall be reviewed by the engineer or architect of record and submitted in writing to the Mason County Building Department prior to construction. All engineering and/or architectural documents are a part of the approved set of plans and shall remain attached thereto. If documents are removed, approval will not be granted. In addition, a re-inspection fee (refer to current fee schedule, minimum 1 hour) will be charged and shall be collected by the Building Department prior to any further inspections being performed or approvals granted.
- * CONSTRUCTION PROCESS TO BE FIELD CORRECTED AS REQUIRED PER MASON COUNTY BUILDING DEPARTMENT AND THE ADOPTED BUILDING CODE.

The construction of the permitted project is subject to inspections by the Mason County Building Department. All construction must be in conformance with the international codes as amended and adopted by Mason County. Any corrections, changes or alterations required by a Mason County Building Inspector shall be made prior to requesting additional inspections.



Mason County

Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

GRADING GRD2024-00005

- * The international code requires a fire apparatus access road for every facility, building, or portion of a building that is more than 150' from an approved access road. Roads are required to meet the minimum Mason County Fire Marshal standards for Fire Apparatus Access Roads up to the point where such roads connect with a county maintained public road or to another fire apparatus access road which connects to a county maintained public road.
- * All building permits shall have a final inspection performed and approved by Mason County Building Department prior to permit expiration. The failure to request a final inspection or to obtain approval will be documented in the legal property records on file with Mason County as being non-compliant with Mason County ordinances and building regulations.
- * The use, handling and storage of hazardous materials or flammable and combustible liquids is not allowed without the approval of the Mason County Fire Marshal.
- * All permits expire 180 days after permit issuance, or 180 days after the last inspection activity is performed. The Building Official may grant one or more extension of 180 days, upon the receipt of a written extension request prior to permit expiration. Letter must indicate that circumstances beyond the control of the permit holder prevented action from being taken.
- * Contractor registration laws are governed under RCW 18.27 and enforced by the WA State Dept of Labor and Industries, Contractor Compliance Division. There are potential risks and monetary liabilities to the homeowner for using an unregistered contractor. Further information can be obtained at 1-800-647-0982. The person signing this condition is either the homeowner, agent for the owner or a registered contractor according to WA state law.
- * Retaining walls needed to support a surcharge such as structures, roads, or to support slopes, shall require a separate building permit and approval prior to construction of the retaining wall.
- * Approved per site plan and topographic cross-section.
- * All culverts shall be maintained in perpetuity to ensure that drainage will not overflow.
- * The owner / applicant shall provide to Mason County inspection reports prepared by the engineer record, complying with the requirements as noted in Chapter 14.44, section 14.44.220 through 14.44.230.
- * Compliance with an approved Storm Water Plan shall be subject to an on site inspection, or inspections, by the engineer of record or an authorized representative. Said inspection(s) shall be performed in accordance with the approved plan, and prior to any modification that would make a determination of compliance impossible.

 Inspection reports shall be submitted to verify all engineering requirements have been completed in accordance with the

approved storm water plan. Reports shall be submitted to the Mason County Department of Community Development prior to each corresponding inspection and final permit approval. Copies of all special inspection reports shall be made available at time of inspection.

* Cut and fill slopes shall be setback from site boundaries in accordance with Section 14.44.190.

I hereby certify that I have read and examined this application and know the same to be true and correct. All provisions of Laws and Ordinances governing this type of work will be complied with whether specified herein or not. The granting of a permit does not presume to give authority to violate or cancel the provisions of any other state/local law regulating construction or the performance of construction.	
Issued By: Contractor or Authorized Agent:	Date:



Approved Plans Printing & Jobsite Requirements

The Mason County Community Development Department has completed the plan review of your project. You are now being issued a permit and may move forward with construction. The approved documents may be retrieved either through the county portal account or the attached flash drive which contains the approved plans and supporting documents.

Please follow these directions carefully and ask questions if you require additional information.

- 1. Print **ALL** *plan sets* a minimum of **II** x **I**7 in **COLOR**. Have the sets available for the County Inspection Staff as needed at the <u>ALL</u> inspections. Do not use the plans for any reason except for inspection purposes.
- 2. Print **one set** of supporting documents in **COLOR**. Have the supporting documents available for the County Inspection Staff at **ALL** inspections.
- 3. Do not modify any documents by writing on them or changing them. Only the "Approved" Stamped County Documents will be recognized for inspection purposes.
- 4. If you do not have the approved documents available for the inspection staff, your inspection may be canceled or delayed.

If you require additional information, please contact our County Permit Center at (360) 427-9670 extension 352.

I acknowledge receipt of the approved documents and understand the requirements for inspection documents being available on site.

Project Representative	Date:	

MASON COUNTY PUD NO. 1

MASON COUNTY

WASHINGTON



MANZANITA RESERVOIR AND BOOSTER PUMP STATION

PUD OFFICIALS

MIKE SHEETZ

RON GOLD

JACK JANDA

DISTRICT 1 COMMISSIONER

DISTRICT 2 COMMISSIONER

DISTRICT 3 COMMISSIONER

KRISTIN MASTELLER
GENERAL MANAGER

PERMIT SET

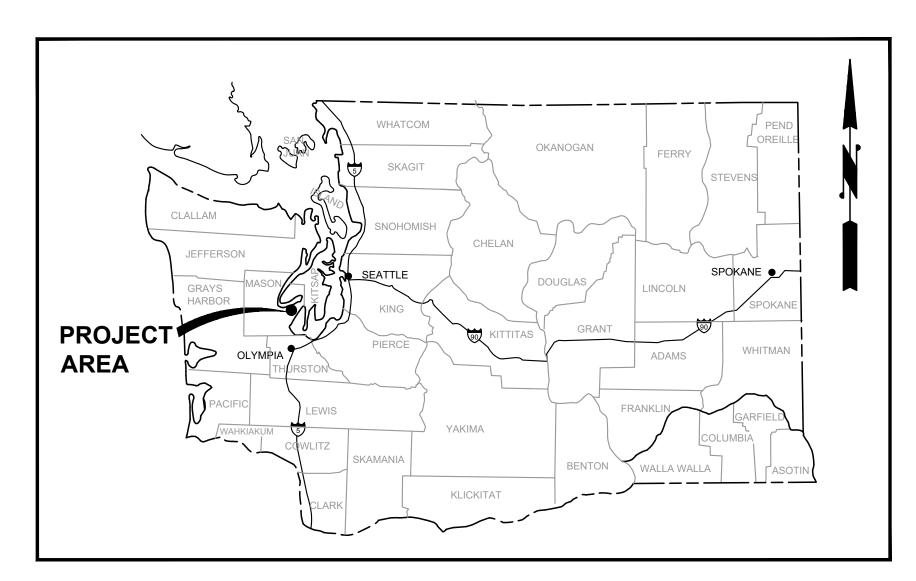
12/10/2024

APPROVED
MASON COUNTY DCD PLANNING
SCOTT RUEDY, AICP



2102 CARRIAGE DRIVE SW, BUILDING OLYMPIA, WA 98502 (360) 292-7481

NOVEMBER 2024 G&O #22260.00



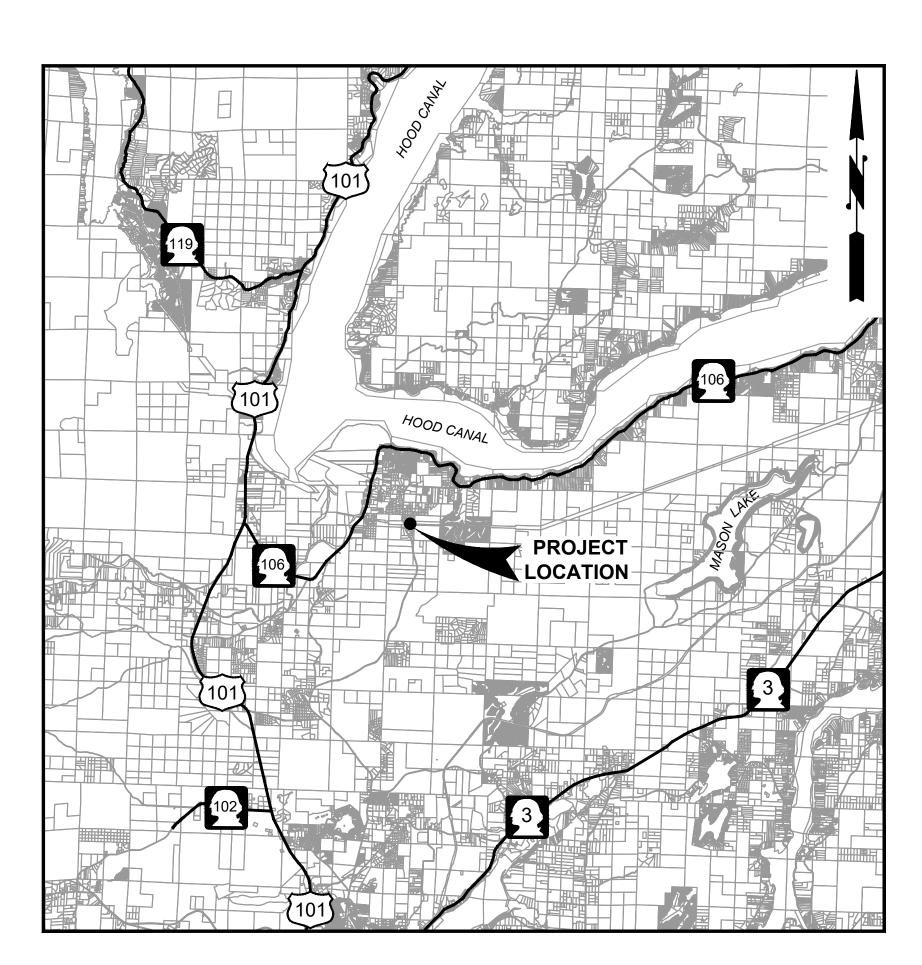
VICINITY MAP

AREA NUMBER

HIGHLAND PARK

MANZANITA RESERVOIRS

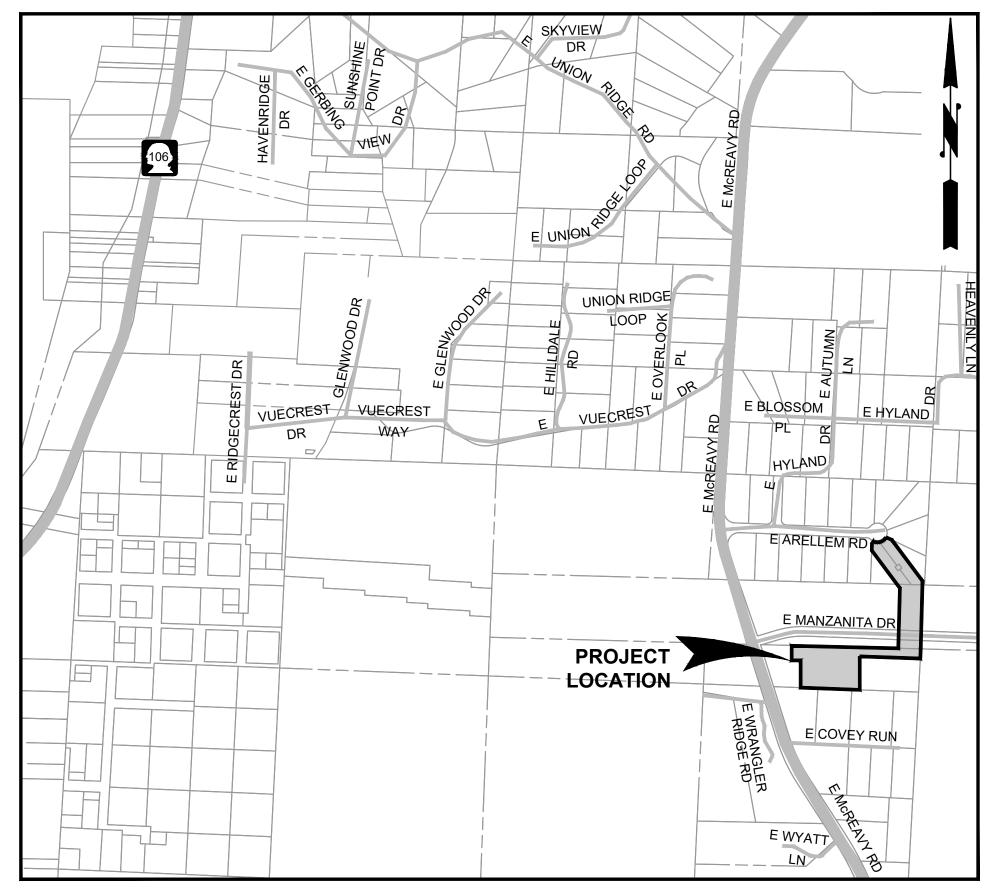
MANZANITA BOOSTER PUMP STATION BUILDING



<u>LOCAT</u>	<u> </u>	1 M	<u>IAF</u>
SCALE:	1" = 1	0,000)'

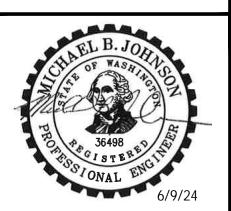
	SHEET INDEX
SHEET NO	DESCRIPTION
	COVER SHEET
GENERAL	
G-1	SHEET INDEX, VICINITY AND LOCATION MAPS
G-2	ABBREVIATIONS, LINETYPES, SYMBOLS, AND GENERAL NOTES
G-3	PROCESS FLOW DIAGRAM
G-4	SURVEY CONTROL - MTN 2 COAST LLC
G-5	SURVEY CONTROL - MTN 2 COAST LLC
G-6	OVERALL EXISTING PROJECT MAP
CIVIL	
C1-1	HIGHLAND PARK EXISTING SITE AND DEMOLITION SITE PLAN
C1-2	HIGHLAND PARK SALVAGE AND DEMOLITION PLAN
C1-3	HIGHLAND PARK PIPING PLAN
C2-1	MANZANITA EXISTING SITE AND DEMOLITION PLAN
C2-2	PROPOSED OVERALL PLAN
C2-3	RESERVOIR AND BOOSTER STATION PIPING PLAN
C2-4	PROPOSED WATER MAIN PLAN
C2-5	PROPOSED STORMWATER POND GRADING AND PIPING PLAN
C2-6	PROPOSED STORMWATER POND GRADING AND PIPING SECTIONS
C2-7	RESERVOIR AND BOOSTER STATION GRADING PLAN
C2-8	RESERVOIR AND BOOSTER PUMP PROPOSED GRADING SECTIONS
CD-1	TESC NOTES
CD-2	TESC DETAILS
CD-3	TRENCH AND RESTORATION DETAILS
CD-4	WATER DETAILS
CD-5	DRAINAGE AND MISCELLANEOUS DETAILS
CD-6	STORMWATER DETAILS
CD-7	FENCE AND GENERATOR PAD DETAILS
MECHANICAL	
M-1	PIPE SYMBOLS, GENERAL SYMBOLS, AREA AND EQUIPEMENT IDENTIFICATIONS
M-2	DETAILS
M2-1	RESERVOIR 1 AND 2 FLOOR PLAN
M2-2	RESERVOIR ROOF PLAN, ELEVATION AND DETAIL
M2-3	RESERVOIR DETAILS
M2-4	RESERVOIR DETAILS
M2-5	RESERVOIR DETAILS
M2-6	RESERVOIR DETAILS
M3-1	BOOSTER PUMP STATION BUILDING PLAN

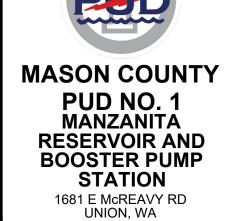
SHEET NO	DESCRIPTION
STRUCTURAL	
S-1	GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS
S-2	TYPICAL STRUCTURAL DETAILS
S-3	TYPICAL STRUCTURAL DETAILS
S3-1	BOOSTER STATION FOUNDATION, FLOOR AND ROOF FRAMING PLAN
S3-2	BOOSTER STATION ELEVATIONS AND CROSS SECTION
S3-3	STRUCTURAL SECTIONS
HVAC	
H2-1	HVAC DESIGN CRITERIA, ABBREV SYMBOLS, EQUIP IDENT & NOTES
H2-2	HVAC FLOOR PLAN
ELECTRICAL	
E-1	ELECTRICAL SYMBOLS ABBREVIATIONS AND GENERAL NOTES
E-2	DEVICE TAG LIST, WORK SUMMARY
E-3	MODIFIED ELECTRICAL SITE PLAN
E-4	MODIFIED ELECTRICAL SITE PLAN
E-5	RESERVOIR 1 AND 2 ELECTRICAL PLAN
E-6	ONE-LINE DIAGRAM
E-7	GROUNDING ONE-LINE DIAGRAM
E-8	POWER CONTROL AND INSTRUMENTATION PLAN
E-9	LIGHTING AND RECEPTACLE PLAN
E-10	HVAC FIRE AND SECURITY
E-11	SITE CONTROL PANEL [03 CP 01] ELEVATIONS
E-12	CONTROL PANEL [03 CP 01] ELEMENTARY WIRING DIAGRAM
E-13	CONTROL PANEL [03 CP 01] ELEMENTARY WIRING DIAGRAM (CONT.)
E-14	[03 PB 01] 480V 3 PHASE PANELBOARD
E-15	[03 PB 02] 240V 1 PHASE PANELBOARD
E-16	AUTODIALER I-O AND ALARMING
E-17	PLC EXTENDED I-O
E-18	CABLE AND CONDUIT SCHEDULE
ED-1	INDOOR TO UNDERGROUND TRANSITIONS
ED-2	CONCRETE RESERVOIR ELECTRICAL DETAILS
ED-3	INTRUSION SWITCH DETAILS
ED-4	SITEWORK DETAILS
ED-5	MISCELLANEOUS DETAILS





Gray & Osborne, Inc. 2102 CARRIAGE DRIVE SW, BUILDING I OLYMPIA, WA 98502 (360) 292-7481





No.	DATE	REVISION
ISSUE	D FOR:	
		PERMIT SET
ISSUE	DATE:	JUNE 2024
APPRO	OVED BY:	MBJ
CHECKED BY:		SLG
DRAWN BY:		JPW

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IN OW	ICHES A	T FULL	SCALE.
NOT.	SCALE	ACCOR	RDINGLY

SLG

22260.00

VIC_MAP.DWG

DESIGNER:

G & O JOB NO.:

GENERAL

SHEET INDEX, VICINITY AND LOCATION MAPS

DRAWING: G-1 OF: 6





THRD

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TYP VERT

W/O

THREADED

THROUGH

TYPICAL

VERTICAL

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WEST WITH WITHOUT

LINETYPES ABBREVIATIONS EXISTING PROPOSED **DESCRIPTION** ASBESTOS CEMENT PIPE ADJUST ALTERNATE SURFACE FEATURES ALT ALUM ALUMINUM ANSI AMERICAN NATIONAL STANDARDS INSTITUTE ASPHALT PAVEMENT ANGLE POINT **ASPH** ASPHALT GRAVEL SURFACING ASSY **ASSEMBLY ASTM** AMERICAN SOCIETY OF TESTING AND MATERIALS FENCE/RAILING (TYPE AS NOTED) AVE **AVENUE BLIND FLANGE FENCE WITH GATE** BLDG BUILDING BLOCK BLK **BLOW OFF** ВО SHRUB/TREE/VEGETATION LINE BOP **BEGINNING OF PROJECT** BEGIN VERTICAL CURVE ELEVATION BVCE **EDGE OF LANDSCAPING BVCS** BEGIN VERTICAL CURVE STATION CONDUIT SILT FENCE CORRUGATED ALUMINUM PIPE CATCH BASIN — — CLEARING LIMITS CUBIC FEET CFS CUBIC FEET PER SECOND **SURVEY** CICL CAST IRON CLASS CLR CLEARANCE CORRUGATED METAL PIPE CMP **RIGHT-OF-WAY LINE** CO CLEANOUT CONC CONCRETE **CENTERLINE OF RIGHT-OF-WAY** CONN CONNECTION CONTINUED/CONTINUOUS CONT PROPERTY LINE CPEP CORRUGATED POLYETHYLENE PIPE CPLG COUPLING PERMANENT EASEMENT LINE CTR CENTER CUBIC YARD CENTER LINE DRAIN DC DEGREE OF CURVATURE DUCTILE IRON <u>UTILITIES</u> DIA DIAMETER DIM DIMENSION — E — — E — — E BURIED ELECTRICAL DEPARTMENT OF TRANSPORTATION DOT DWGS DRAWING(S) **OVERHEAD POWER** EAST —— OP —— OP —— EACH **ELEVATION POWER** ELEC **ELECTRICAL** EOA **EDGE OF ASPHALT** BURIED TELEPHONE/COMMUNICATIONS EOP **END OF PROJECT** EVCE END VERTICAL CURVE ELEVATION WATER MAIN (SIZE AS NOTED) **EVCS** END VERTICAL CURVE STATION **EXIST EXISTING** LIQUID PROPANE (SIZE AS NOTED) FIG **FIGURE** FIN **FINISHED** STORM DRAIN (SIZE AS NOTED) FLANGE FEET CULVERT (SIZE & TYPE AS NOTED) GAUGE GALV GALVANIZED GALVANIZED IRON GATE VALVE HDPE HIGH DENSITY POLYETHYLENE PIPE INSIDE DIAMETER INVERT ELEVATION INVERT LENGTH POUND LINEAR FEET MAXIMUM MFR MANUFACTURER MANHOLE MIN MINIMUM MISC MISCELLANEOUS MECHANICAL JOINT NORTH NUMBER NOT TO SCALE NTS ON CENTER OD OUTSIDE DIAMETER POINT OF CURVATURE PLAIN END PERF PERFORATED POINT OF INTERSECTION POWER POLE PT POINT OF TANGENCY PVC POLYVINYL CHLORIDE POINT OF VERTICAL INTERSECTION PVI **PVMT** PAVEMENT POINT OF VERTICAL TANGENT PVT QTY QUANTITY **RADIUS** RIGHT-OF-WAY R/W RED REDUCER REINF REINFORCE REQD REQUIRED RET RETAINING RAILROAD SOUTH SCH SCHEDULE SQUARE FEET SHT SHEET SLOPE SPECS SPECIFICATIONS SQUARE STATION STA STD STANDARD THRUST BLOCK TOP OF CURB TEL TELEPHONE TEMPORARY EROSION AND SEDIMENT CONTROL TESC

WATER SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
Э]	CAP/PLUG
#	薑	COUPLING/ADAPTER
\triangleright	>	REDUCER
	⋖	THRUST BLOCK
⊞		WATER METER
	±	DRAFT HYDRANT
		SAMPLE STATION
	<u>JOINTS</u>	
	I	FLANGE/BLIND FLANGE
С	Г	MECHANICAL JOINT
	VALVES	
P°		AIR RELIEF VALVE
٩		BLOW-OFF VALVE
\bowtie	H	GATE VALVE
	₫	INLINE CHECK VALVE

POWER/TELEPHONE SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
-0-		UTILITY POLE
\leftarrow		UTILITY POLE ANCHOR
		UTILITY PEDESTAL

FLEXIBLE EXPANSION JOINT

SURVEY SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
×		HUB AND TACK
⊕		REBAR AND CONTROL CAP

SANITARY/STORM SEWER SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
0	0	STORM DRAIN MANHOLE/TYPE 2 CATCH BASIN (ACTUAL DIMENSION SHOWN FOR PROPOSED)
		STORM DRAIN CATCH BASIN, CONCRETE INLET, OR YARD/AREA DRAIN (ACTUAL DIMENSION SHOWN FOR PROPOSED)
0		CLEAN OUT

SURFACE FEATURES/LANDSCAPING

EXISTING	PROPOSED	DESCRIPTION
		BUILDING
		MAIL BOX (NOTED)
Д		SIGN
M		TREE STUMP
X		TREE (CONIFER)
\odot		TREE (DECIDUOUS)

GENERAL NOTES:

- ALL MATERIALS AND WORKMANSHIP SHALL BE FURNISHED AND SUPPLIED IN ACCORDANCE WITH THE 2022 EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, UNLESS OTHERWISE SPECIFICALLY NOTED.
- 2. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT AND COORDINATE WITH ALL UTILITY COMPANIES IN ORDER TO ASSURE THAT ALL LINES, PIPES, POLES AND OTHER APPURTENANCES ARE PROPERLY LOCATED, SECURED, AND/OR PROTECTED. BURIED UTILITIES (WHERE KNOWN) ARE SHOWN IN THEIR APPROXIMATE LOCATION. THE CONTRACTOR SHALL HAVE UTILITIES VERIFIED ON THE GROUND PRIOR TO ANY CONSTRUCTION. NOTIFY THE UNDERGROUND UTILITIES LOCATE CENTER: 1-800-424-5555.
- 3. ON-SITE EROSION AND SEDIMENT CONTROL MEASURES ARE REQUIRED AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- 4. THE CONTRACTOR SHALL HAVE A COPY OF THESE PLANS, ANY ADDENDA, CHANGE ORDERS, AND THE CONTRACT SPECIFICATIONS ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
- THE CONTRACTOR SHALL MAINTAIN A CLEAN LEGIBLE SET OF RECORD DRAWINGS AND PROVIDE A SET TO THE OWNER PRIOR TO DEMOBILIZATION OF THE SITE. SEE SPECIFICATIONS.

CHILB. JOHN OF WAS RIVED OF WAS

Gray & Osborne, Inc

2102 CARRIAGE DRIVE SW,

BUILDING I

OLYMPIA, WA 98502

(360) 292-7481



MASON COUNTY PUD NO. 1 MANZANITA RESERVOIR AND BOOSTER PUMP STATION

RESERVOIR AND BOOSTER PUMP STATION 1681 E McREAVY RD UNION, WA

No.	DATE	REVISION		
ISSUED FOR:				
PERMIT SET				
ISSUE DATE: JUNE 2024				
APPROVED BY:		MBJ		
CHECKED BY:		SLG		

 DESIGNER:
 SLG

 G & O JOB NO.:
 22260.00

 FILE:
 LEGEND.DWG

 0
 1"
 2"

 1
 1

JPW

DRAWN BY:

TWO INCHES AT FULL SCALE.
IF NOT, SCALE ACCORDINGLY

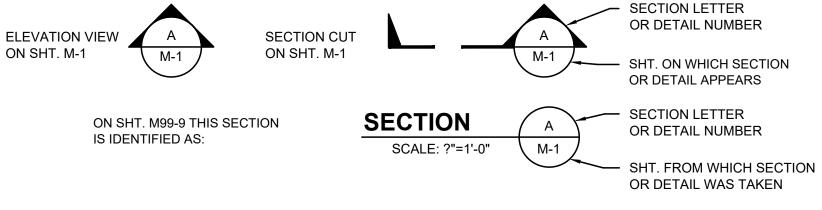
GENERAL

ABBREVIATIONS, LINETYPES, SYMBOLS, AND GENERAL NOTES

DRAWING: **G-2** OF: **6**

EXAMPLE OF SECTION NUMBERING SYSTEM AND PLAN/DRAWING TITLES

FOR DETAILS SUBSTITUTE DETAIL NUMBER FOR SECTION LETTER



DRAWING TITLE

SCALE: ?"=1'-0"

SECTION LETTER
OR DETAIL NUMBER

SECTION APPEARS ON SAME DWG AS CUT

SECTION LETTER
OR DETAIL NUMBER

TYP

SECTION IS TYPICAL TO MANY PLACES

DRAWING TITLE IDENTIFICATION :

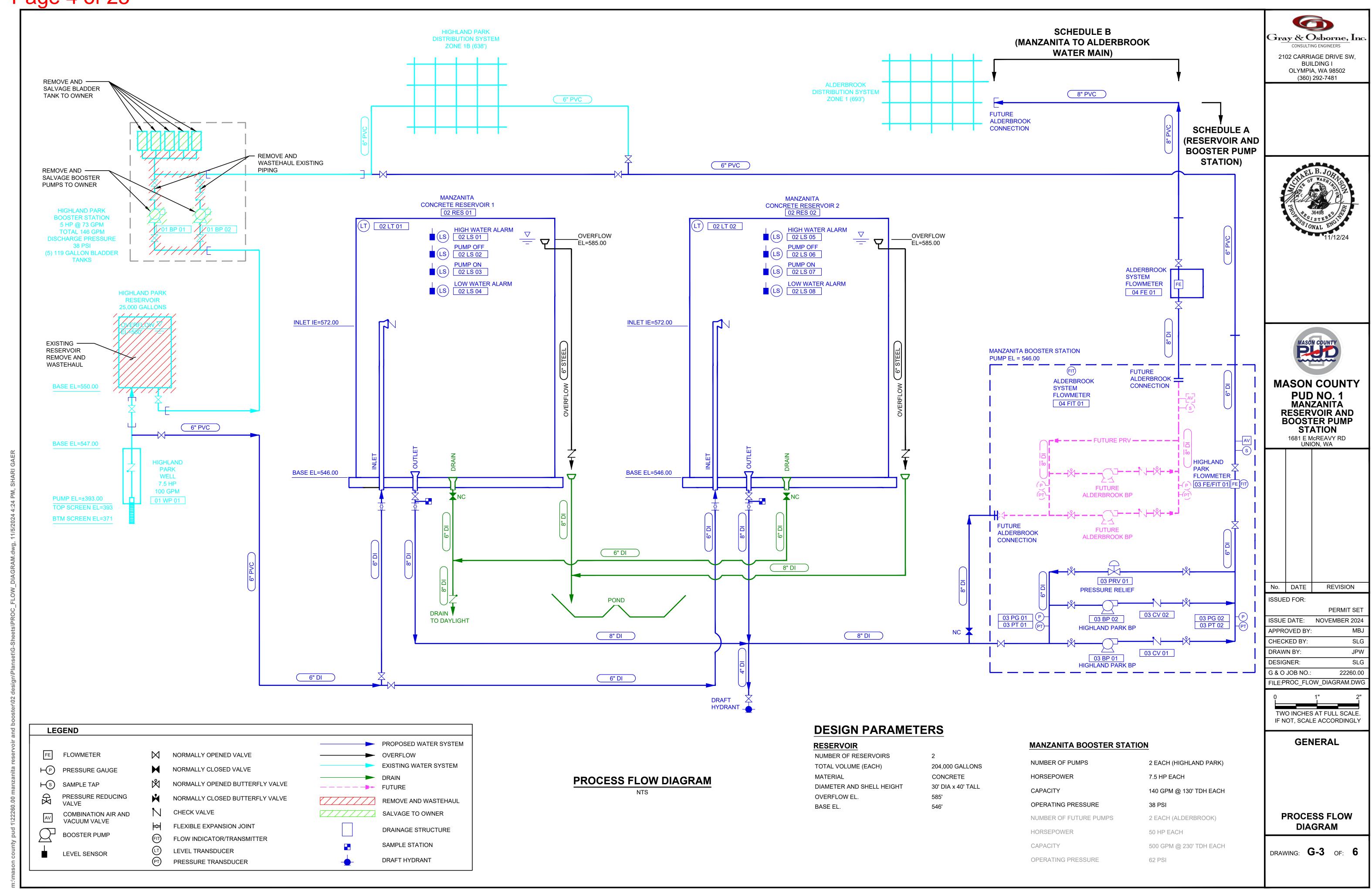
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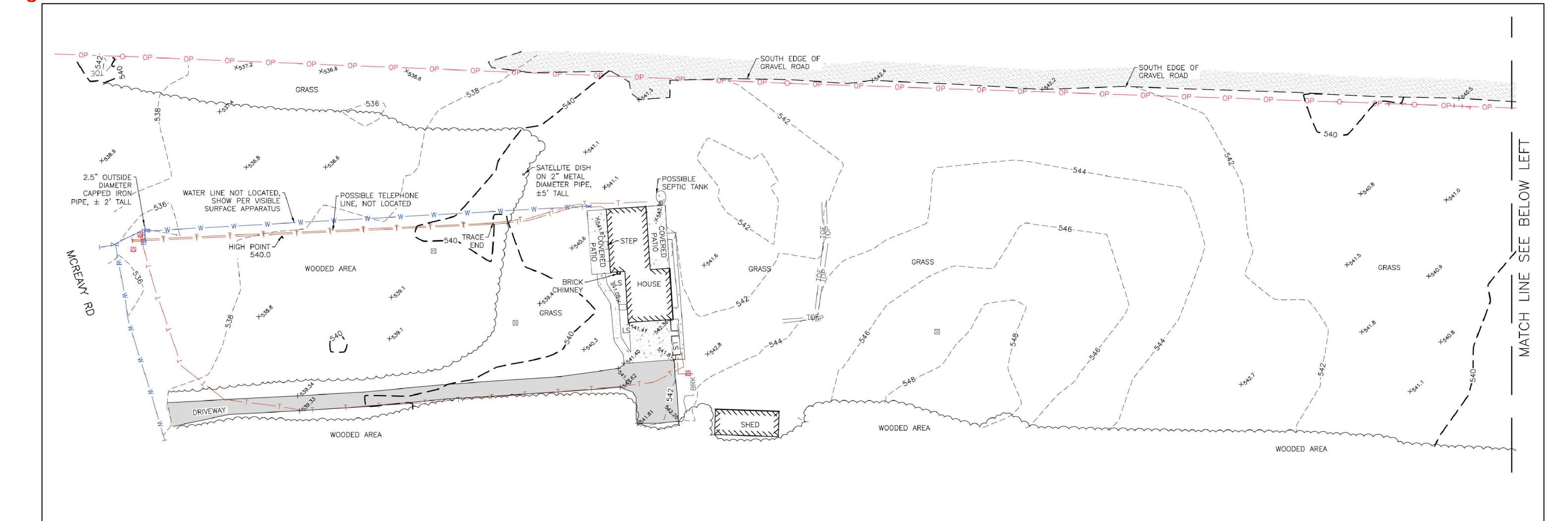
DETAILS ARE REFERENCED IN

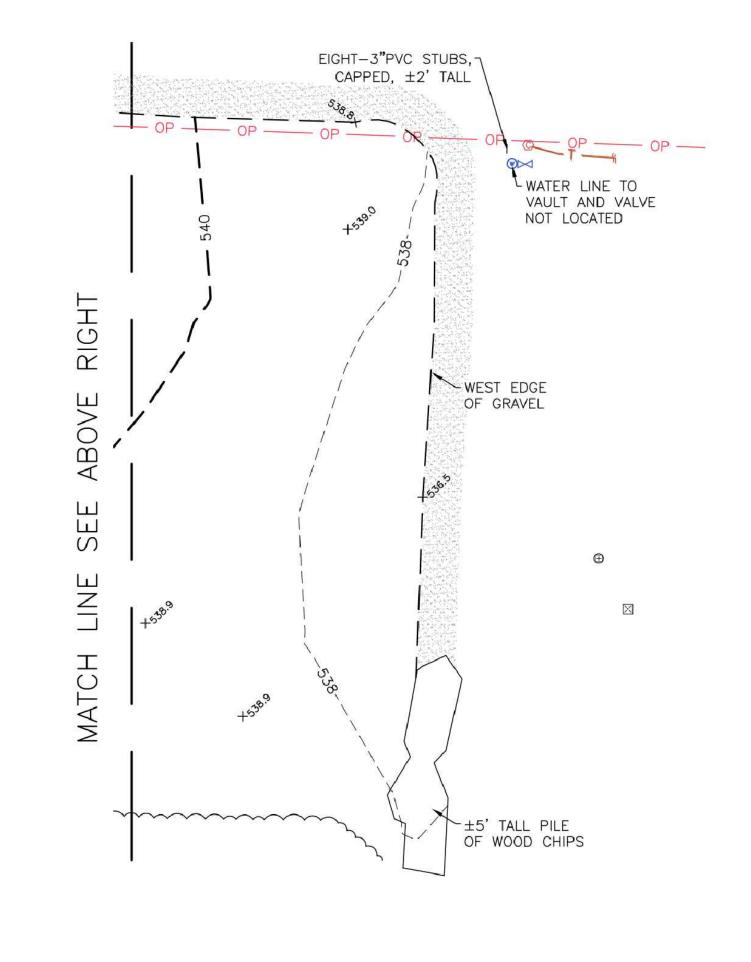
ARE USED INSTEAD OF LETTERS

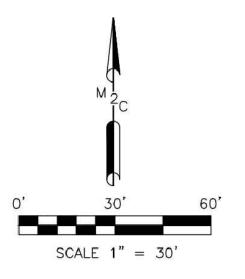
A SIMILAR MANNER EXCEPT NUMBERS

Page 4 of 25









DATUM

HORIZONTAL - WASHINGTON STATE PLANE COORDINATES, SOUTH ZONE, NAD 83/2011 BASED ON GPS TIES TO MONUMENT POST PROCESSED THROUGH OPUS SOLUTION.

VERTICAL - NAVD 88 BASED ON GPS TIES TO MONUMENT POST PROCESSED THROUGH OPUS SOLUTION.

UTILITY NOTE

UTILITIES SHOWN HEREON ARE FROM FIELD MAPPING VISIBLE SURFACE APPURTENANCES, AND MAPPING UTILITY PAINT MARKS FROM A UTILITY LOCATING SERVICE. BURIED UTILITIES ARE ONLY SHOWN AS APPROXIMATE AND SHOULD BE VERIFIED BEFORE CONSTRUCTION.

SURVEY NOTES

- 1. INSTRUMENT USED: SOKKIA IX 3" TOTAL STATION AND TOPCON VR GPS. 2. THIS SURVEY MEETS OR EXCEEDS THE STANDARDS OF WAC 332-130-145 3. SURVEY COMPLETED 5/9/2022
- 4. NO BOUNDARY INFORMATION WAS OBTAINED OR COMPLETED. 5. PURPOSE OF TOPOGRAPHICAL MAPPING IS FOR FUTURE DEVELOPMENT OF SITE. 6. CONTOURS WERE ESTABLISHED FROM FIELD MAPPING, 1' CONTOURS SHOWN.

7. MTN2COAST (M2C) WAS RETAINED BY MASON PUD NO.1 TO COMPLETE A

TOPOGRAPHIC SURVEY OF TPN 321053100000.

O CABLE RISER/ PEDESTAL

- LS LANDSCAPE
- TELEPHONE RISER
- ₩ WATER METER
- WATER VALVE WATER VAULT/MANHOLE
- ↓ GUY ANCHOR
- POWER POLE PP WITH DROP LINE
- POWER TRANSFORMER
- M HUB AND TACK ⊕ REBAR AND CONROL CAP

— T — T — T —
— P — P — P —
—— OP —— OP ——
— W—— W—— W——
— c — c — c —

—— TOE —— TOE ——
TOP —— TOP ——

----- BRK ------ BRK ------

GROUND TOP GROUND BREAK **GRAVEL**

GROUND TOE

ASPHALT CONCRETE

5/26/2022

		(1-0
DATE	F /05 /0000	Day Luce That
00115	5/26/2022	1 5 5
SCALE		The state of the s
	1" = 30'	The of Washing
M2C PROJEC	T NO.:	OF WASHING OF
	22-108	
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- ethic in the control of the control	MYC	21013244 PROPERTY ONAL LAND SUR
CHECKED		7 21013244
	SEP	21013244
APPROVED	3-041488	ONAL LAND
The second control of the second seco		ra .



TUMWATER, WA 98512

360.688.1949

1681 E MCREAVY RD UNION, WA TOPOGRAPHIC SURVEY PROFESSIONAL LAND SURVEYORS 2320 MOTTMAN RD SW, STE 106

PROJECT NAME:

MASON PUD NO.1

SV-1G-4 of: 6 SHEET NO. 1 OF 1

SHEET NAME:

CLIENT NAME:

Page 6 of 25 UTILITY AND WATER-STORAGE AREA EASEMENT PER THE PLAT N: 741006.18 E: 998287.97— EL: 539.75 MNMAG MATCH LINE SEE SV-2 PUBLIC WATER > ADDITIONAL MAPPING COMPLETED 12/2022. 30.00' BY 30.00' PERPENDICULAR AND PARALLEL TO LOT LINE COVERED CAR PORT WITH SHED CAT PLAY AREA WITH CHICKEN WIRE SHED(SITS ON 0.5'-TALL GRAVEL PAD) WEST EDGE OF GRAVEL N: 740913.51 E: 998406.62 EL: 536.89 MNHT NO3'06'51"E 566.61 EAST LINE OF HIGHLAND PARK NO.1 - RAILROAD TIE RETAINING WALL WATER LINE TO ~ VAULT AND VALVE METAL GATE N: 740834.53 E: 998407.78 EL: 535.51 MINHT L+/- 6' TALL EIGHT-3"PVC STUBS, CYCLONE FENCE CAPPED, ±2' TALL CYCPP 12"-IE(W) 536.7 SCALE 1" = 30' ADDITIONAL TOPOGRAPHIC MAPPING AND BOUNDARY COMPLETED ON DECEMBER 15TH PROJECT NAME: SHEET NAME: AND 19TH OF 2022 BY MTN2COAST (M2C). M2C 12/20/2022 ESTABLISHED THE BOUNDARY OF PLAT OF 1681 E MCREAVY RD 1" = 30' M2C PROJECT NO.: HIGHLAND PARK NO. 1 UNDER AFN 285592 BY UNION, WA TYING OUT AND HOLDING CENTERLINE MONUMENTS FOR ARELLEM ROAD. 22-108 TOPOGRAPHIC SURVEY SV-2A FULL BOUNDARY SURVEY WAS NOT DRAWN COMPLETED BY M2C & NO CORNERS WERE SET. RMS G-5 of: 6 PROFESSIONAL LAND SURVEYORS 2320 MOTTMAN RD SW, STE 106 CHECKED CLIENT NAME: TUMWATER, WA 98512 APPROVED MASON PUD NO.1 360.688.1949

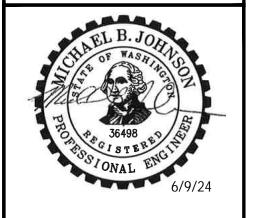
Page 7 of 25 Gray & Osborne, Inc. 2102 CARRIAGE DRIVE SW, **BUILDING I** OLYMPIA, WA 98502 (360) 292-7481 LOT 10 LOT 9 DHUYVETTER 230 E ARELLEM RD 321055100009 CONCRETE -WATER TANK EXISTING WELL AND BOOSTER STATION PUMP STATION BUILDING **AREA NUMBER** PUBLIC UTILITY
DISTRICT A
22 E ARELLEM RD HIGHLAND PARK MANZANITA RESERVOIRS MANZANITA BOOSTER PUMP STATION BUILDING **E ARELLEM ROAD** E MANZANITA DR **MATCHLINE - SEE ABOVE MASON COUNTY** PUD NO. 1 MANZANITA RESERVOIR AND FIEDLER 220 E ARELLEM RD CITY OF TACOMA 111 E MANZANITA DR 321050062010 **BOOSTER PUMP** STATION 1681 E McREAVY RD UNION, WA 20' PROPOSED EASEMENT CITY OF TACOMA 111 E MANZANITA DR EX 148 LF 12" DI @ 0.54% — IE(E) 537.2 — EX METAL MAJOR POWER LINES 321050062010 WITH MULTIPLE LINES, OVERHEAD EX CONTROL STRUCTURE -POWER LINES SHOWN ON MAP REPRESENT POLE TO POLE LOCATION RIM=542.00 IE=538.00 12" DI S -538 MASON COUNTY PUD NO. 1 ► EIGHT - 3" 1681 E McREAYY RD GRASS PVC STUBS, 321053100000 CAPPED, ±2' TALL No. DATE REVISION SYSTEM - WATER LINE POSSIBLE ~ SATELLITE DISH ON 2" -DRAIN TO VAULT METAL DIAMETER SEPTIC TANK ISSUED FOR: FIELD AND VALVE PIPE, ±5' TAĻL - 2.5" OUTSIDE DIAMETER CAPPED NOT LOCATED PERMIT SET IRON PIPE, ± 2' ABOVE GRAVEL **EXISTING** ISSUE DATE: JUNE 2024 SUBSTATION POND APPROVED BY: WATER LINE NOT LOCATED, — SHOW PER VISIBLE SURFACE CHECKED BY: SLG APPARATUS JPW DRAWN BY: SLG DESIGNER: GRASS COVERED -TRACE -G & O JOB NO.: 22260.00 PATIO LINE, NOT LOCATED END EXISTING. FILE: OVERALL EX PLAN.DWG ELECTRICAL BRICK -6 DI @ 2.56% CHIMNEY SUBSTATION WOODED AREA ENTERING UNION -GRASS **A** 8 TWO INCHES AT FULL SCALE FOG LINE — IF NOT, SCALE ACCORDINGLY _ CVCMP 12" IE(NW) 536.0 **GENERAL** GOOD 1630 E McREAVY RD ±5' TALL PILE OF WOOD CHIPS 321053100010 WOODED AREA WOODED AREA KIRK COMPANY HIRSCH - CVCMP 12" SKANES HERRICK XX **OVERALL EXISTING** GOOD XX **ST JEAN** 151 E COVEY RUN RD IE(SE) 536.4 141 E COVEY RUN RD 121 E COVEY RUN RD 111 E COVEY RUN RD **PROJECT MAP** 321054000000 321057790014 321057790013 321053400010 321057790012 321057790011 DRAWING: **G-6** OF: **6 OVERALL EXISTING PROJECT MAP** SCALE: 1"=40'

Page 8 of 25 Gray & Osborne, Inc. 2102 CARRIAGE DRIVE SW, **BUILDING I** OLYMPIA, WA 98502 (360) 292-7481 1. SEE SECTION 01110 FOR CONSTRUCTION TIMING LIMITATIONS. RAILROAD TIE ---- SEE SHEET CD-1 AND CD-2 FOR EROSION CONTROL NOTES AND DETAILS. **RETAINING WALL** /- 100' RESTRICTIVE EASEMENT COVERED PARKING (SITS ON 0.5' TALL DHUYVETTER 230 E ARELLEM RD GRAVEL PAD) CAT PLAY AREA WITH - +/- 6' TALL CYCLONE FENCE CHICKEN WIRE 321055100009 +/- 3' TALL BOARD ¬ FENCE CONCRETE WATER TANK -EXISTING WELL AND -HOUSE **BOOSTER STATION** PUMP STATION +/- 3' TALL BOARD\FENCE , \ BUILDING - CAP EXISTING RESERVOIR OUTLET LOT 19 ----**PUBLIC UTILITY** 30.00' BY 30.00' #EXISTING CONCRETE / DISTRICT A 222 E ARELLEM RD COVERED CAR PORT WITH , PERPENDICULAF RESERVOIR REMOVE AND WASTEHAULED C1-2 AND PARALLEL 7 LOT LINE . 321055100019 **MASON COUNTY** PUD NO. 1 MANZANITA RESERVOIR AND **BOOSTER PUMP** STATION 1681 E McREAVY RD UNION, WA UTILITY AND WATER — STORAGE AREA EASEMENT PER THE PLAT <u></u> WATER MARKER POST CAP EXISTING RESERVOIR INLET 20' PROPOSED — EASEMENT AND PROPOSED CLEARING LIMITS CLEARING AND GRADING LIMITS TYP. SILT FENCE, TYP. CITY OF TACOMA 111 E MANZANITA DR HIGHLAND PARK SALVAGE
AND DEMO PLAN C1-2 321050062010 — CAP EXISTING BOOSTER PUMPS DISCHARGE FIEDLER 220 E ARELLEM RD No. DATE REVISION 321055100008 ISSUED FOR: PERMIT SET ISSUE DATE: JUNE 2024 APPROVED BY: SLG CHECKED BY: DRAWN BY: SLG DESIGNER: G & O JOB NO.: 22260.00 HP DEMO PLAN.DWG HIGHLAND PARK EXISTING SITE AND DEMOLITION PLAN TWO INCHES AT FULL SCALE.
IF NOT, SCALE ACCORDINGLY SCALE: 1"=20' CIVIL **HIGHLAND PARK EXISTING SITE AND DEMOLITION SITE PLAN** DRAWING: C1-1 OF: 3

DEMOLITION NOTES:

- 1. EXISTING RESERVOIR AND BOOSTER STATION TO REMAIN IN SERVICE UNTIL NEW BOOSTER STATION AND RESERVOIRS ARE DISINFECTED, COMMISSIONED, AND CONNECTED TO SYSTEM AND IN SERVICE.
- 2. ISOLATE AND DRAIN EXISTING RESERVOIR BEFORE BEGINNING DEMOLITION WORK.
- 3. REMOVE AND WASTEHAUL EXISTING RESERVOIR AND APPURTENANCES.
- 4. REMOVE AND WASTEHAUL OR SALVAGE TO OWNER EXISTING BOOSTER STATION COMPONENTS.
- 5. DEMOLISH EXISTING SITE PIPING AND APPURTENANCES, CAP ALL CUT PIPES THAT ARE TO REMAIN CONNECTED TO THE SYSTEM.







PUD NO. 1 MANZANITA RESERVOIR AND **BOOSTER PUMP** STATION 1681 E McREAVY RD UNION, WA

No. DATE REVISION ISSUED FOR: PERMIT SET

ISSUE DATE: JUNE 2024 APPROVED BY: CHECKED BY: DRAWN BY: DESIGNER: G & O JOB NO.: 22260.00



HP DEMO PLAN.DWG

CIVIL

HIGHLAND PARK SALVAGE AND DEMOLITION PLAN

DRAWING: C1-2 OF: 3



EXISTING RESERVOIR TO BE DEMOLISHED AND WASTEHAULED.

- EXISTING WELL AND BOOSTER STATION BUILDING.

EXISTING BOOSTER

PUMPS (2) TO BE

REMOVED AND

SALVAGED TO THE

OWNER.

EXISTING BLADDER TANKS (5) TO BE REMOVED AND SALVAGED TO OWNER.

EXISTING PIPING TO BE -REMOVED AND WASTEHAULED.

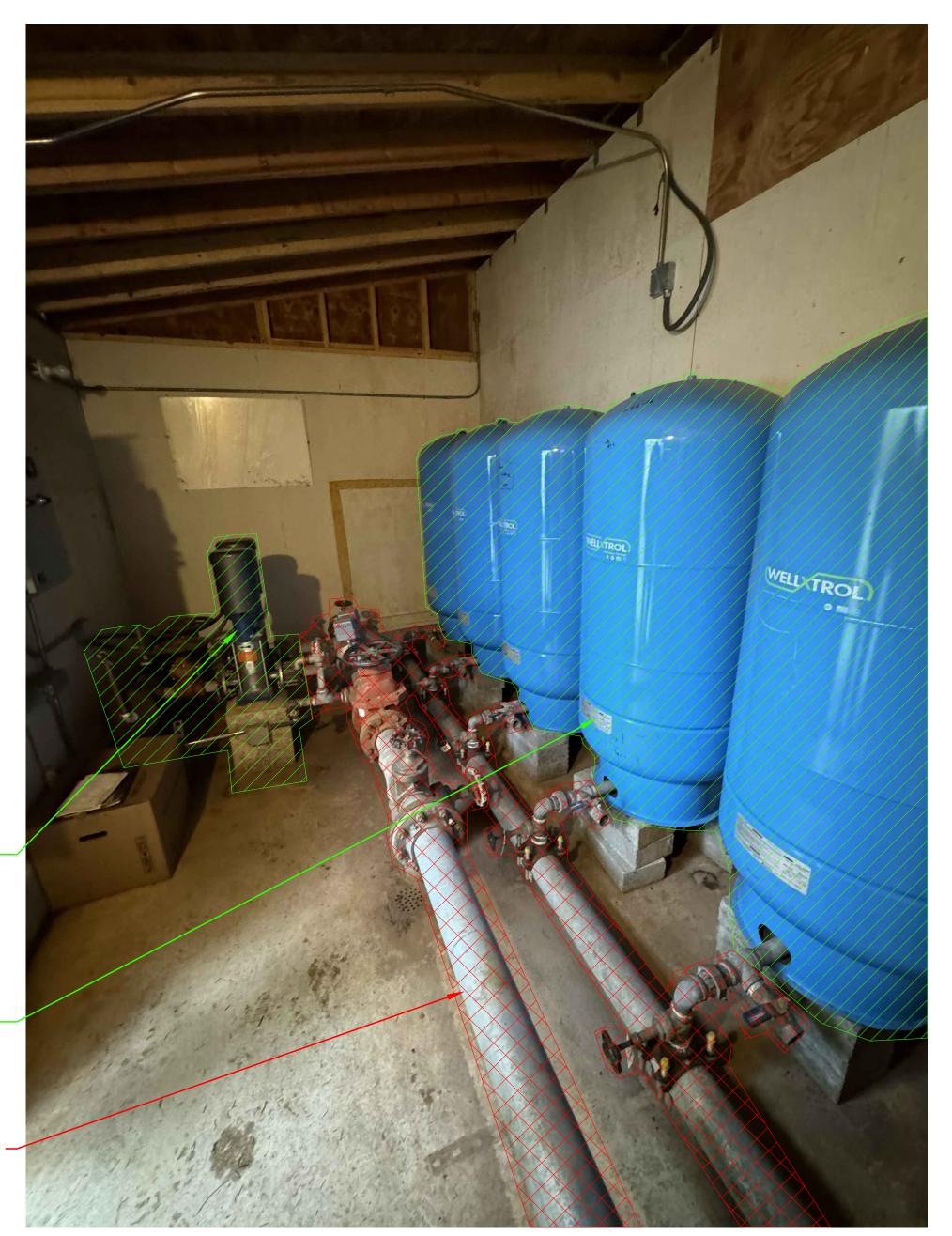
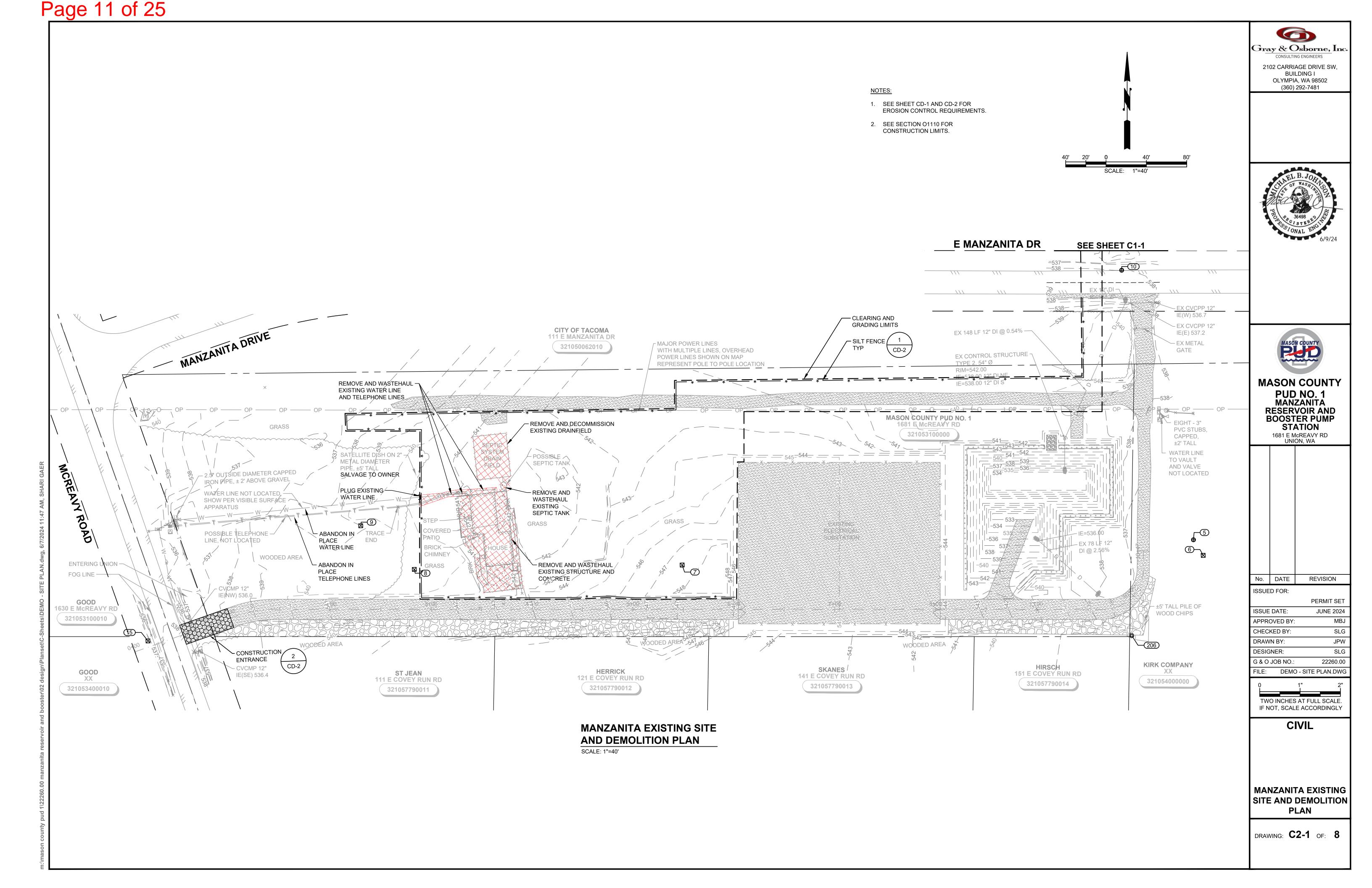
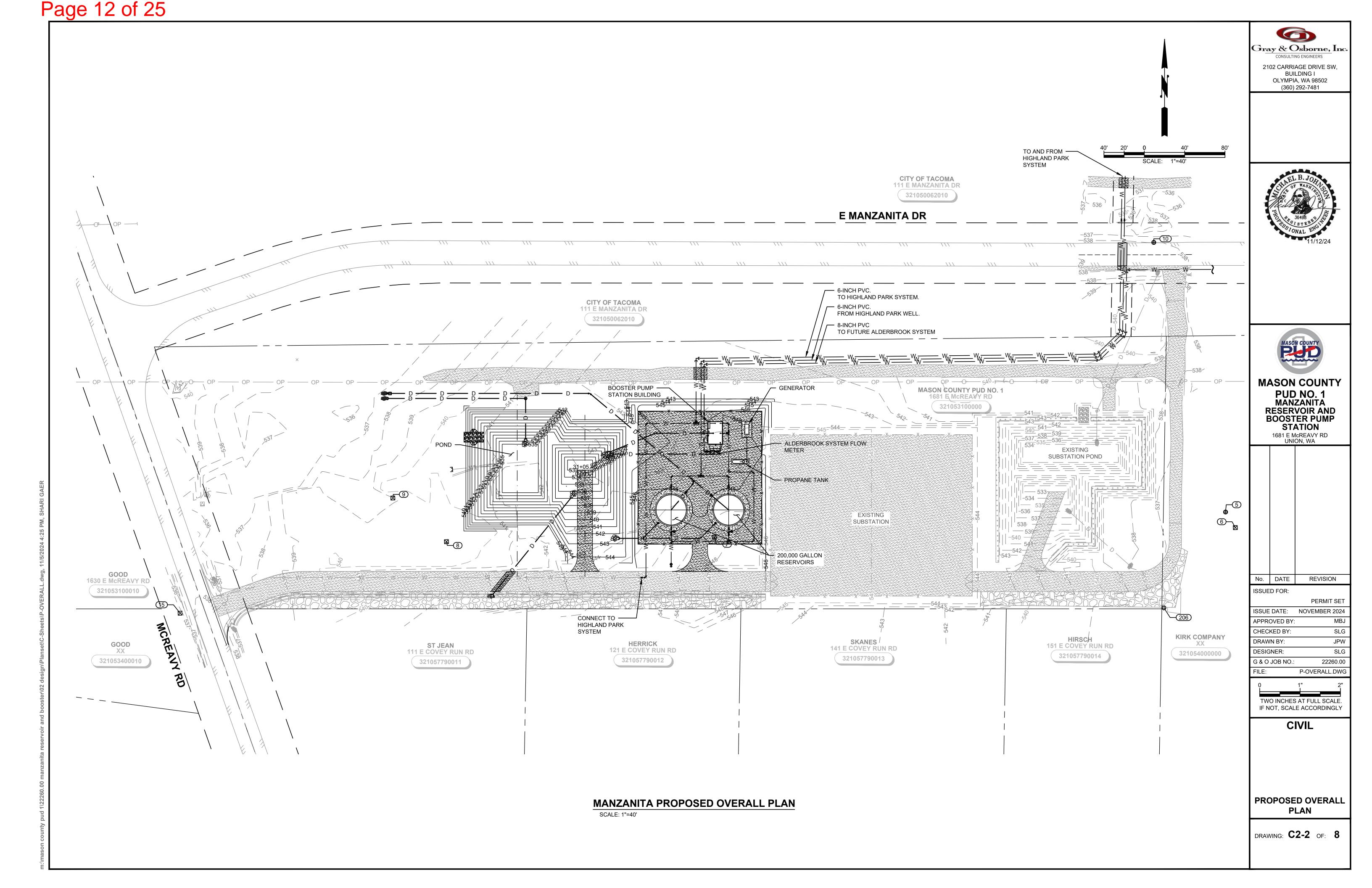


PHOTO DETAIL **EXISTING RESERVOIR DEMOLITION PLAN** NOT TO SCALE

PHOTO DETAIL HIGHLAND PARK SALVAGE AND DEMOLITION PLAN NOT TO SCALE

Page 10 of 25 Gray & Osborne, Inc. 2102 CARRIAGE DRIVE SW, **BUILDING I** OLYMPIA, WA 98502 (360) 292-7481 RAILROAD TIE ----**RETAINING WALL** - 100' RESTRICTIVE NOTES: EASEMENT COVERED PARKING (SITS ON 0.5' TALL 1. SEE SHEET CD-3 FOR TYPICAL PIPE TRENCH SECTION. DHUYVETTER 230 E ARELLEM RD GRAVEL PAD) CAT PLAY AREA WITH __ +/- 6' TALL BACKFILL w/ 2 FEET OF — GRAVEL BORROW AND 2. PIPING BETWEEN POINTS OF INDICATED ELEVATION SHALL BE SET AT CHICKEN WIRE CYCLONE FENCE 321055100009 A SINGLE UNIFORM GRADE. CD-3 HYDROSEED +/- 3' TALL BOARD ¬ 3. WHERE PIPES CROSS WITH LESS THAN ONE FOOT CLEARANCE, CDF FENCE - SHED SHALL BE USED BETWEEN THE PIPES. CONCRETE WATER TANK 4. THE CONTRACTOR SHALL BE RESPONSIBLE TO FIELD VERIFY LOCATIONS, SIZE, AND TYPE OF AL CONNECTIONS TO EXISTING EXISTING WELL AND -HOUSE SYSTEMS PRIOR TO MAKING THE CONNECTION. BOOSTER STATION PUMP STATION PRIOR TO CONNECTING TO THE EXISTING SYSTEM, THE CONTRACTOR BUILDING BOARD\FENCE,\ SHALL DISINFECT THE WATER PIPING AND OBTAIN THE SATISFACTORY PRESSURE TEST AND BACTERIOLOGICAL TEST RESULTS. LOT 19 ----PUBLIC UTILITY DISTRICT A 222 E ARELLEM RD 30.00' BY 30.00' - COVERED CAR PORT WITH 6. ALL DISTURBED AREAS NOT SHOWN WITH HMA OR GRAVEL PERPENDICULAR RESTORATION SHALL BE HYDROSEEDED PER DETAIL 5 ON SHEET CD-3. AND PARALLEL 1 LOT LINE 321055100019 — 1 - 6" 45° BEND (MJxMJ) TO RESERVOIRS w/ RESTRAINED JOINTS E=533.50 6" W N=740,853.97 E=998,357.00 **MASON COUNTY** 6" W UTILITY AND WATER -— DETAIL∕B TO HIGHLAND PARK SYSTE PUD NO. 1 MANZANITA STORAGE AREA 1 - 6" 45° BEND (MJxMJ) -w/ RESTRAINED JOINTS EASEMENT PER THE PLAT VATER RESERVOIR AND DETAIL A MARKER POST IE=533.50 **BOOSTER PUMP** N=740,853.06 STATION E=998,353.95 1681 E McREAVY RD UNION, WA CITY OF TACOMA 111 E MANZANITA DR 321050062010 **FIEDLER** EASEMENT 321055100008 HIGHLAND PARK PIPING PLAN No. DATE REVISION SCALE: 1"=20' ISSUED FOR: $\begin{pmatrix} 4 \\ CD-3 \end{pmatrix}$ GRAVEL TRENCH REPAIR PERMIT SET ISSUE DATE: JUNE 2024 APPROVED BY: CHECKED BY: SLG DRAWN BY: SLG DESIGNER: G & O JOB NO.: 22260.00 P - WATER PLAN.DWG CAP EXISTING PIPE — EXISTING WELL & Y TWO INCHES AT FULL SCALE BOOSTER PUMP IF NOT, SCALE ACCORDINGLY CAP EXISTING PIPE BUILDING 6" PVC 6" PVC CIVIL 1 - 6" 90° BEND (MJxPE) — w/ RESTRAINED JOINTS 1 - 6" FLEXIBLE COUPLING — 1 - 6" GATE VALVE (MJxMJ) 1 - 6" FLEXIBLE COUPLING N=741,067.13 1 - 6" 90° BEND (PExMJ) — w/ RESTRAINED JOINTS 1 - 6" GATE VALVE(MJxMJ) └E──₩──₹ E=998,227.15 1 - 6" 90° BEND (MJxMJ) — **►►** PVC C900 WATER MAIN LIMITS ► PVC C900 WATER MAIN LIMITS IE=537.33 N=741,031.73 w/ RESTRAINED JOINTS IE=537.33 HIGHLAND PARK E=998,225.56 N=741,052.07 **PIPING PLAN** E=998,206.79 **DETAIL A DETAIL B** NOT TO SCALE DRAWING: C1-3 OF: 3 NOT TO SCALE





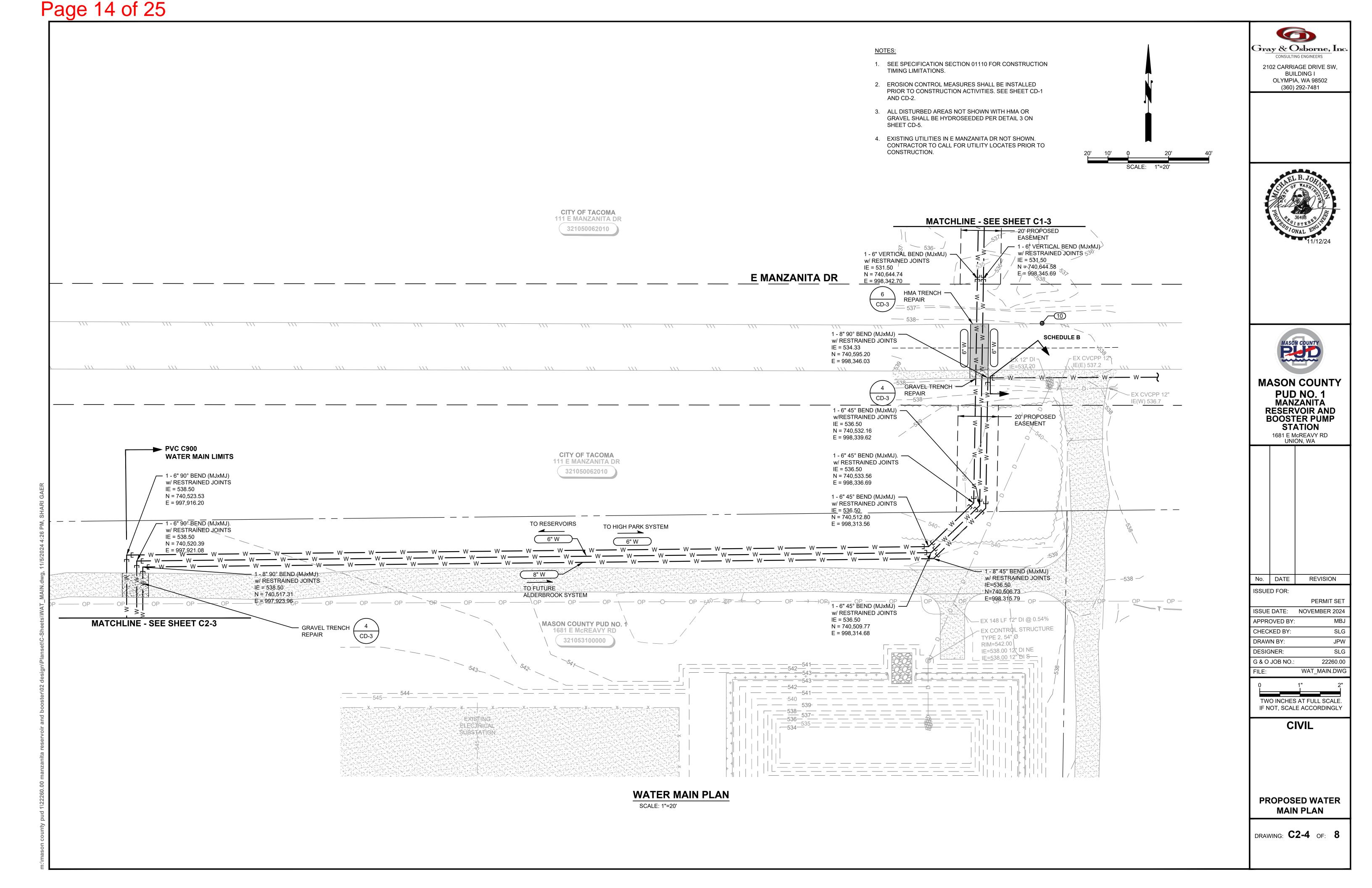
Page 13 of 25 RESERVOIR DRAIN OUTLET **MATCHLINE - SEE SHEET C2-4** CD-5 Gray & Osborne, Inc 2102 CARRIAGE DRIVE SW **BUILDING I** OLYMPIA, WA 98502 (360) 292-7481 GENERATOR (6" W S-2 PROPANE NOTES THE OWNER'S PROPANE VENDOR, PEAK PROPANE, WILL PROVIDE AND INSTALL A - FILL VALVE "1,000 WATER GALLON" LIQUID PROPANE TANK THAT WILL SUPPLY A VAPOR (SEE NOTE 9) SUPPLY TO THE GENERATOR. EARTHWORK, TRENCHING, BACKFILL, AND 4" D RESTORATION SHALL BE BY GENERAL CONTRACTOR. THE LP VAPOR LINE, A 1ST STAGE PROPANE REGULATOR AT THE FUEL TANK AND A 2ND STAGE REGULATOR AT THE GENERATOR SHALL BE SIZED. PROVIDED AND LP VAPOR FUEL LINE, LOCATED BY THE OWNER'S PROPANE VENDOR TO ALLOW THE GENERATOR TO BELOW GROUND (SEE OPERATE AT 100% LOAD PER NFPA 58. THE GENERATOR HAS A FUEL CONSUMPTION BUILDING -NOTE 8) RATE OF 220 CUBIC FEET PER HOUR AT 100% LOAD. CONTRACTOR TO CONNECT TO DRAIN THE GENERATOR. CD-5 _ IE=539.77 3. LOCATE THE FILLER VALVE ON THE WEST SIDE OF THE FUEL TANK. 4" D **WATER SYSTEM** NORTHING **EASTING POINT INVERT EL** ALDERBROOK LIQUID PROPANE SYSTEM TANK (SEE NOTE 7) **FLOWMETER** VAULT N=740,468.67 E=997,919.14 1 - 6" VERTICAL BEND (MJxMJ) 542.00 DRAIN FUEL TANK CD-5 HOUSEKEEPING 1 - 6" TEE (FLxFL) 8" W 2 - 6" GATE VALVES (FLxMJ) N=740,406.71 E=997,916.81 542.00 1 - 6" FLANGE ADAPTER (FLxMJ) 6" W 6" W **MASON COUNTY** N=740,407.83 E=997,887.16 1 - 6" 90° BEND (MJxMJ) 542.00 PUD NO. 1 MANZANITA N=740,405.69 E=997,944.12 1 - 6" 90° BEND (MJxMJ) **RESERVOIR AND** 1 - 8" TEE (MJxMJ) N=740,343.23 E=997,884.74 542.00 **BOOSTER PUMP** 1 - 8" x 6" REDUCER (PExMJ) STATION 1681 E McREAVY RD 1 - 8" TEE (MJxMJ) N=740,341.09 E=997,941.70 542.00 UNION, WA N=740,340.15 E=997,966.68 1 - 8" 90° BEND (MJxMJ) EXISTING ELECTRICAL SUBSTATION E=997,969.26 1 - 8" 90° BEND (MJxMJ) N=740,408.75 N=740,409.69 E=997,944.27 542.00 1 - 8" 90° BEND (MJxMJ) PIPING 1 - 8" TEE (MJxFL) N=740,448.16 | E=997,945.72 | 1 - 8" GATE VALVE (FLxMJ) M2-3 1 - 8" X 6" REDUCER (PExMJ) N=740,457.98 E=997,946.09 1-6" 90° BEND (MJxMJ) OVERFLOW: -x OUTLET -PROPOSED PROPOSED RESERVOIR 1 RESERVOIR 2 1 - 6" TEE (FLxFL) N=740,374.35' N=740,372.21' 2 - 6" GATE VALVES (FLxMJ) N=740,459.20 E=997,913.78 541.00 E=997,885.90' M2-4 E=997,942.87' 1 - 6" FLANGE ADAPTER (FLxMJ) M2-3 1 - 6" 90° BEND (MJxMJ) N=740,461.06 E=997,864.14 No. DATE REVISION 1 - 6" 90° BEND (MJxMJ) ISSUED FOR: w/ THRUST BLOCK RESERVOIR OVERFLOW -N=740,308.33 E=997,858.41 541.00 STÁTION PERMIT SET CD-4 CONNECT TO EXISTING DRAIN OUTLET CD-5 | IE=542.84 w/ 6" FLEXIBLE COUPLING ISSUE DATE: NOVEMBER 2024 (15) N=740,468.86 E=997,914.14 1 - 6" VERTICAL BEND (MJxMJ) APPROVED BY: 8" D (8" D CHECKED BY: SLG N=740,438.73 E=997,948.37 1 - 8" 90° BEND (MJxMJ) 542.33 DRAWN BY: 8" W N=740,468.53 E=997,922.11 1 - 8" 90° BEND (MJXMJ) DESIGNER: SLG 542.33 G & O JOB NO.: 22260.00 N=740,430.92 E=997,920.72 1-8" VERTICAL VEND (MJXMJ) 542.33 P - PIPE-PLAN.DWG **DRAIN SYSTEM** TWO INCHES AT FULL SCALE NORTHING INVERT EL TYPE **EASTING** POINT IF NOT, SCALE ACCORDINGLY NOTES:

1. SEE SHEET CD-3 FOR TYPICAL PIPE TRENCH SECTION. CIVIL OVERFLOW PIPE N=740,359.66 E=997,929.33 543.33 1-8" 90° BEND (MJxMJ) CD-4 /HYDRANT 2. PIPING BETWEEN POINTS OF INDICATED ELEVATION SHALL BE SET AT A SINGLE UNIFORM GRADE. N=740,345.15 E=997,913.69 1-8" 45° BEND (MJxMJ) 3. WHERE PIPES CROSS WITH LESS THAN ONE FOOT CLEARANCE, CDF SHALL BE USED BETWEEN THE PIPES. OVERFLOW PIPE N=740,361.80 E=997,872.37 543.33 4. THE CONTRACTOR SHALL BE RESPONSIBLE TO FIELD VERIFY 1-8" 90° BEND (MJxMJ) LOCATIONS, SIZE, AND TYPE OF ALL CONNECTIONS TO EXISTING 6" W SYSTEMS PRIOR TO MAKING THE CONNECTIONS. RESERVOIR AND 1-8" WYE (MJxMJ) N=740,347.29 E=997,856.73 **BOOSTER STATION** 5. ALL BURIED WATER PIPING SHALL BE PROVIDED WITH RESTRAINED **PIPING PLAN** JOINTS. 1-8" 45° BEND (MJxMJ) N=740,343.23 E=997,884.74 6. PRIOR TO CONNECTING TO THE EXISTING SYSTEM, THE CONTRACTOR 1-8" WYE (MJxMJ) **MANZANITA RESERVOIR AND BOOSTER STATION** SHALL DISINFECT THE WATER PIPING AND OBTAIN SATISFACTORY 1-6" 45 ° BEND (MJxMJ) DRAWING: **C2-3** OF: **8** N=740,403.12 E=997,908.72 539.01 PRESSURE TEST AND BACTERIOLOGICAL TEST RESULTS. PROPOSED PIPING PLAN 1-8"x6" REDUCER (MJxPE) SCALE: 1"=10'

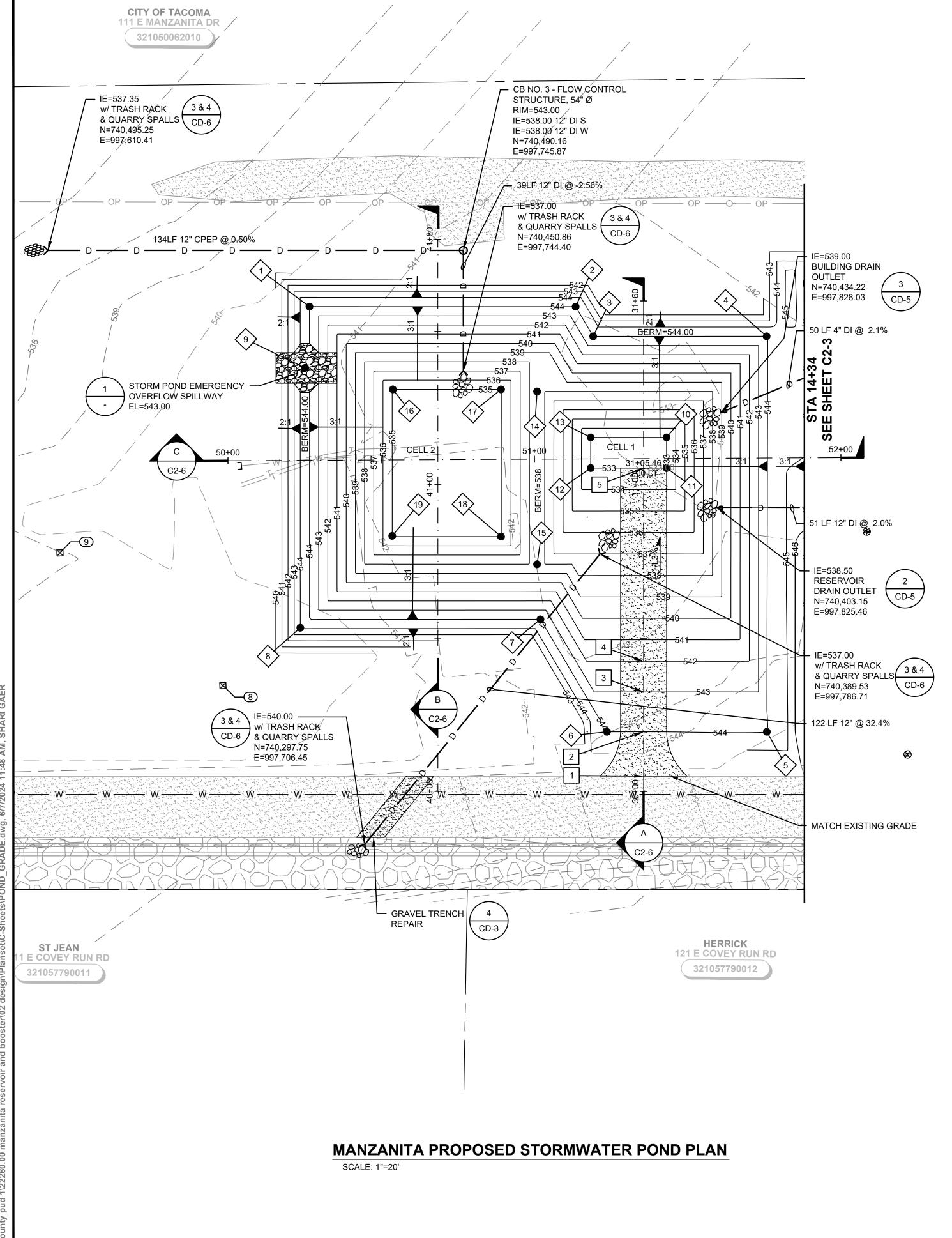
1-8" 45° BEND (MJxMJ)

N=740,492.77

E=997,809.68



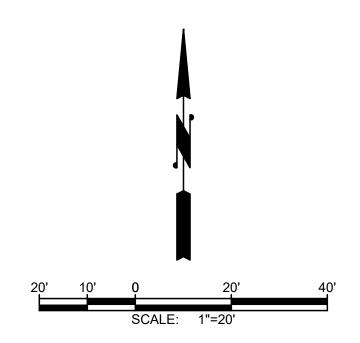
Page 15 of 25



STORMWATER POND INFORMATION			
FACILITY TYPE	DETENTION / WETPOND		
BOTTOM ELEVATION (CELL 1)	533.00		
BOTTOM ELEVATION (CELL 2)	535.00		
SEDIMENT STORAGE ELEVATION (CELL 1)	534.00		
REQUIRED DEAD STORAGE VOLUME (WATER QUALITY)	0.309 AC-FT		
DESIGN DEAD STORAGE AREA (WATER QUALITY)	0.398 AC-FT		
WATER QUALITY SURFACE ELEVATION	538 FT		
BERM ELEVATION	544.00		
EMERGENCY OVERFLOW WATER SURFACE ELEVATION	543.00'		
REQUIRED LIVE STORAGE VOLUME (DETENTION)	0.614 AC-FT		
DESIGN LIVE STORAGE AREA (DETENTION)	0.910 AC-FT		
TOP OF LIVE STORAGE SURFACE	542.00		

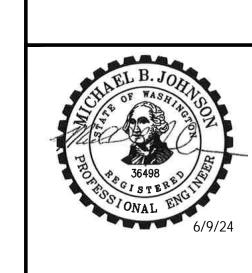
STORMWATER POND ACCESS ROAD INFORMATION						
POINT #	ITEM	NORTHING & EASTING ELEVATION				
1	BEGIN ACCESS RD	N=740,316.59	E=997,798.21	544.73*		
2	GRADE BREAK	N=740,331.05	E=997,798.74	544.00		
3	GRADE BREAK	N=740,344.04	E=997,799.23	543.00		
4	GRADE BREAK	N=740,354.04	E=997,799.60	542.00		
5	BOTTOM CELL 1	N=740,416.98	E=997,802.15	533.00		
	* MATCH EXISTING ELEVATION					

POINT #	ITEM	NORTHING A	NORTHING AND EASTING		
1	POND TOP	N=740,473.73	E=997,695.00		
2	POND TOP	N=740,470.45	E=997,781.80		
3	POND TOP	N=740,460.58	E=997,787.15		
4	POND TOP	N=740,458.44	E=997,844.06		
5	POND TOP	N=740,329.55	E=997,838.93		
6	POND TOP	N=740,331.50	E=997,786.83		
7	POND TOP	N=740,368.98	E=997,766.24		
8	POND TOP	N=740,368.91	E=997,688.07		
9	EMERGENCY OVERFLOW SPILLWAY	N=740,453.79	E=997,692.82		
10>	CELL 1 BOTTOM	N=740,426.70	E=997,809.83		
11>	CELL 1 BOTTOM	N=740,416.71	E=997,809.46		
12	CELL 1 BOTTOM	N=740,417.64	E=997,784.72		
13>	CELL 1 BOTTOM	N=740,427.63	E=997,785.10		
14>	WETPOND BERM	N=740,443.28	E=997,768.18		
15	WETPOND BERN	N=740,386.97	E=997,766.06		
16	CELL 2 BOTTOM	N=740,445.72	E=997,721.20		
17>	CELL 2 BOTTOM	N=740,444.39	E=997,756.46		
18	CELL 2 BOTTOM	N=740,396.42	E=997,754.67		
19	CELL 2 BOTTOM	N=740,397.75	E=997,719.41		



NOTES:

- NUMERICAL CALL-OUTS REFER TO FINISHED GRADE ELEVATIONS UNLESS OTHERWISE NOTED.
- 2. SLOPE FINISHED GROUND AWAY FROM ALL STRUCTURES; SLOPE TO DRAIN AT 2% MIN SLOPE.
- 3. EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO CONSTRUCTION ACTIVITIES. SEE SHEET CD-1 AND C-2.
- 4. SEE DETAIL 8 ON CD-3 FOR PLANTING OF POND. ALL OTHER DISTURBED AREAS NOT SHOWN WITH GRAVEL RESTORATION SHALL BE HYDROSEEDED PER DETAIL 5 ON SHEET CD-3.
- 5. SEE SPECIFICATION SECTION 01110 FOR CONSTRUCTION TIMING LIMITATIONS.



Gray & Osborne, Inc.

2102 CARRIAGE DRIVE SW, BUILDING I OLYMPIA, WA 98502

(360) 292-7481

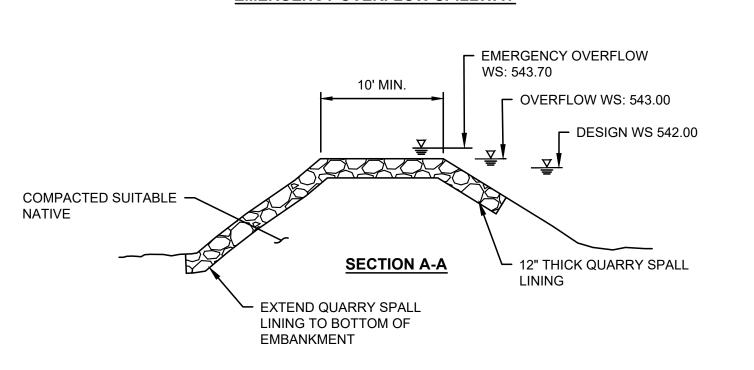


MASON COUNTY
PUD NO. 1
MANZANITA
RESERVOIR AND
BOOSTER PUMP
STATION
1681 E MCREAVY RD

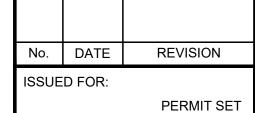
UNION, WA

l -	10'	ı
EL=544.00 6" MIN. FREEBOARD OVERFLOW WS: 543.00	A A A	OUTLET ELEVATION: 543.00 ANTICIPATED OUTLET MAXIMUM FLOW RATE 2.252 CFS

EMERGENCY OVERFLOW SPILLWAY







APPROVED BY: MBJ
CHECKED BY: SLG
DRAWN BY: JPW
DESIGNER: SLG
G & O JOB NO.: 22260.00
FILE: POND_GRADE.DWG

TWO INCHES AT FULL SCALE.
IF NOT, SCALE ACCORDINGLY

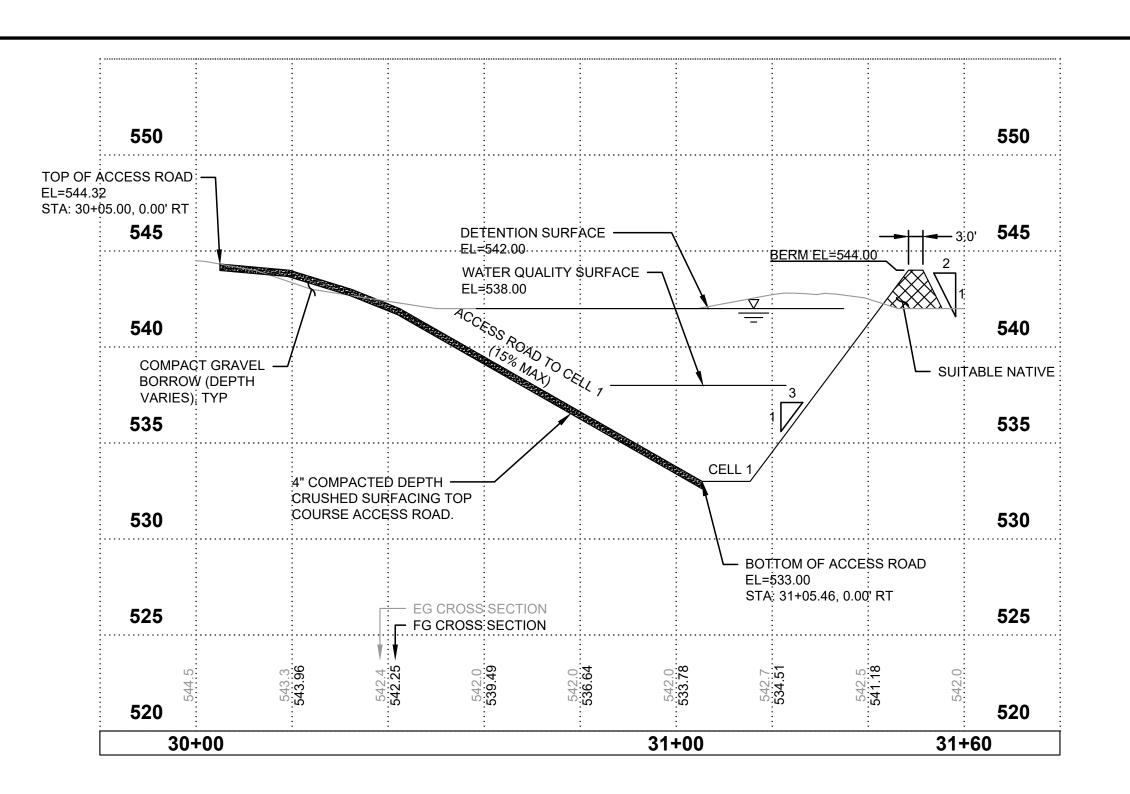
CIVIL

PROPOSED STORMWATER POND GRADING AND PIPING

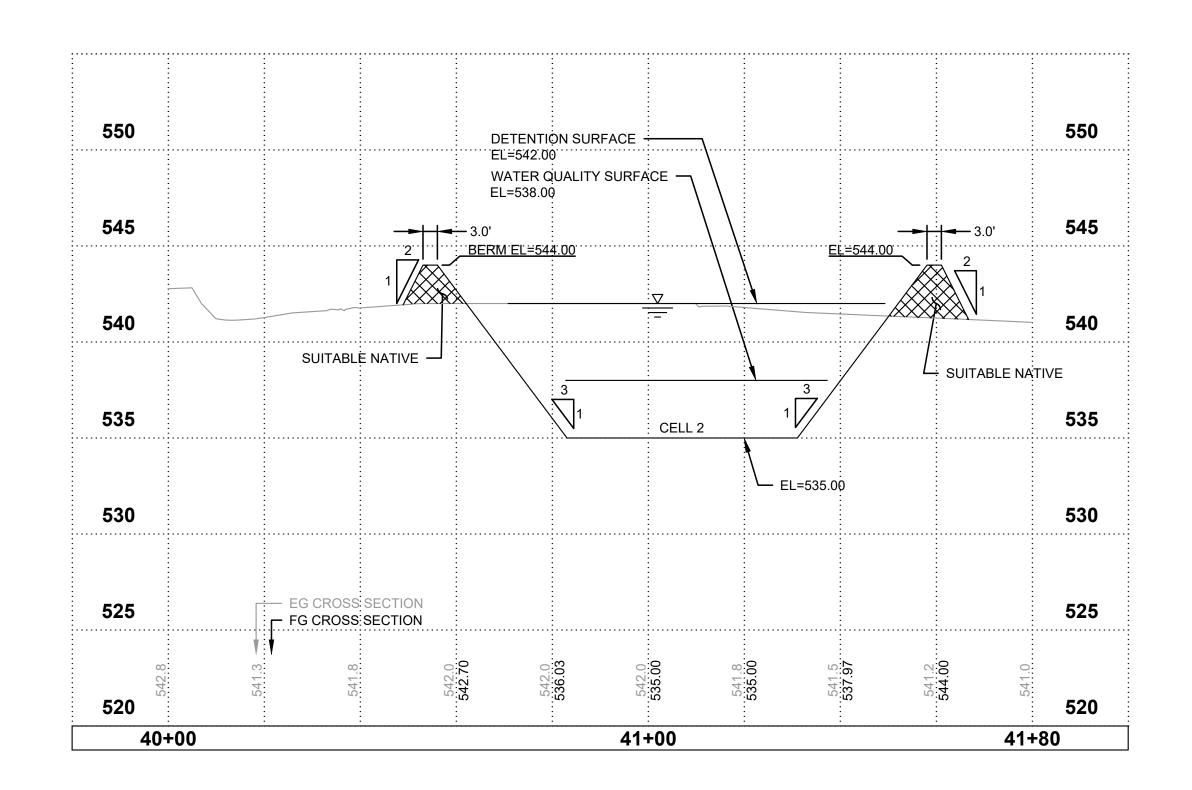
DRAWING: C2-5 OF: 8

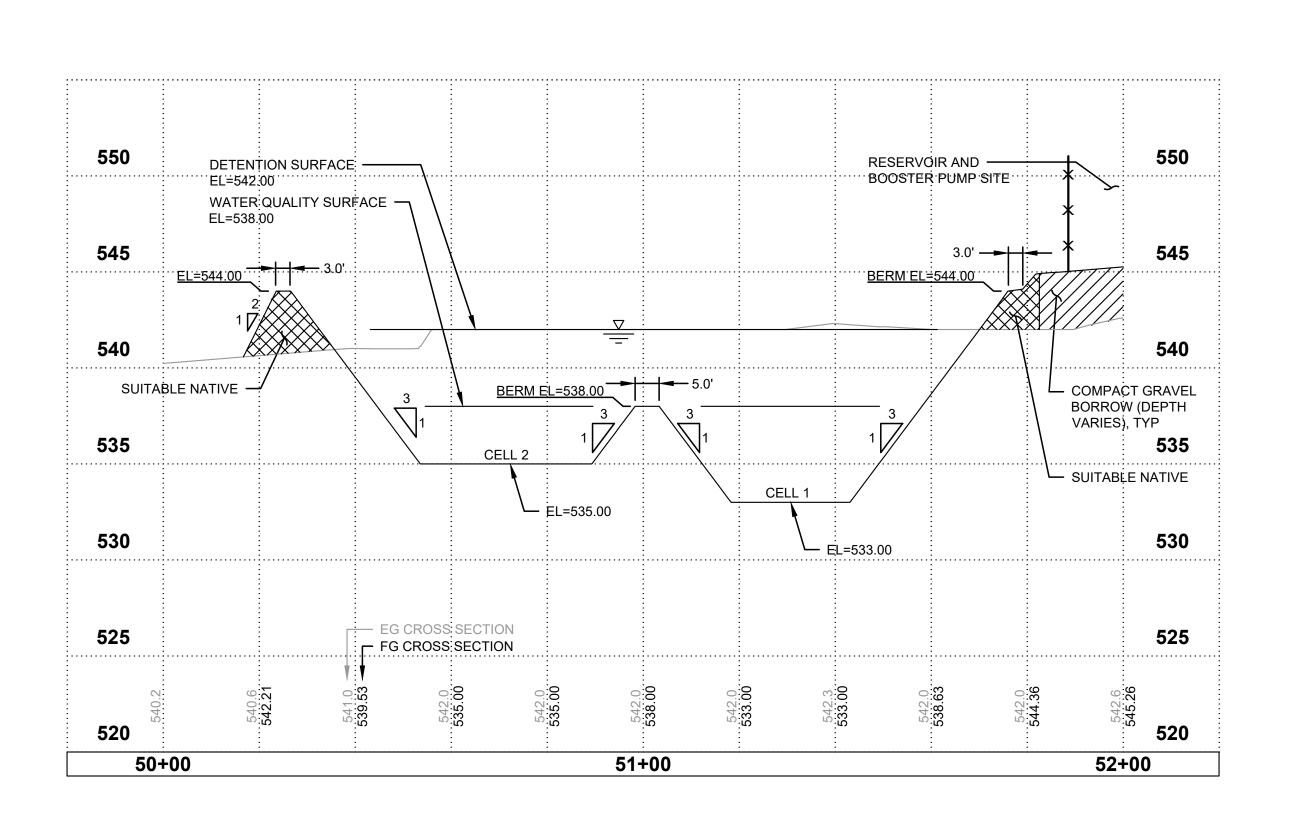
PLAN

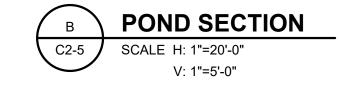
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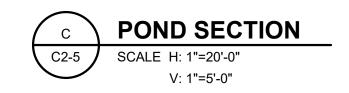












Cray & Osborne, Inc.

CONSULTING ENGINEERS

2102 CARRIAGE DRIVE SW,
BUILDING I
OLYMPIA, WA 98502
(360) 292-7481





PUD NO. 1 MANZANITA RESERVOIR AND BOOSTER PUMP STATION 1681 E MCREAVY RD UNION, WA

No. DATE REVISION
ISSUED FOR:

PERMIT SET

ISSUE DATE: JUNE 2024

APPROVED BY: MBJ

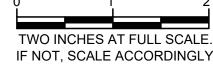
CHECKED BY: SLG

DRAWN BY: JPW

DESIGNER: SLG

G & O JOB NO.: 22260.00

FILE: POND_GRADE.DWG



CIVIL

PROPOSED
STORMWATER POND
GRADING AND PIPING
SECTIONS

DRAWING: **C2-6** OF: **8**

Page 17 of 25 Gray & Osborne, Inc. 2102 CARRIAGE DRIVE SW, **BUILDING I** OLYMPIA, WA 98502 (360) 292-7481 EL=545.00 EL=545.80 EL=546.00 EL=546.00 N=740,460.25 E=997,925.83 .<u>EL=546.00</u> N=740,459.66 E=997,959.16 NOTES: NUMERICAL CALL-OUTS REFER TO FINISHED GRADE ELEVATIONS UNLESS OTHERWISE NOTED. BOOSTER <u>STATION</u> BUILDING EL=544.50 . 2. SLOPE FINISHED GROUND AWAY FROM ALL STRUCTURES; EL=545.85 SLOPE TO DRAIN AT 2% MIN SLOPE. EL=546.00 N=740,443.30 3. EROSION CONTROL MEASURES SHALL BE INSTALLED EL=546.00 N=740,437.74 E=997,938.99 PRIOR TO CONSTRUCTION ACTIVITIES. SEE SHEET CD-1 E=997,968.55 AND CD-2. 4. ALL DISTURBED AREAS NOT SHOWN WITH GRAVEL RESTORATION SHALL BE HYDROSEEDED PER DETAIL 5 ON SHEET CD-3. 5. SEE SPECIFICATION SECTION 01110 FOR CONSTRUCTION TIMING LIMITATIONS. HOUSEKEEPING PAD STA 14+20 SEE SHEET C2-EXISTING ELECTRICAL SUBSTATION FENCE SCHEDULE EL=545.00 **NORTHING & EASTING** POINT # N=740,343.18 E=997,903.25 DOUBLE SWING GATE POST **MASON COUNTY** PUD NO. 1 MANZANITA RESERVOIR AND N=740,342.43 E=997,923.23 DOUBLE SWING GATE POST FENCE CORNER POST N=740,340.51 E=997,974.19 **BOOSTER PUMP** N=740,468.42 E=997,979.00 FENCE CORNER POST STATION 1681 E McREAVY RD UNION, WA N=740,473.00 E=997,857.09 FENCE CORNER POST FENCE CORNER POST N=740,345.09 E=997,852.28 RESERVOIR 1 RESERVOIR 2 FF=546.00 N=740,374.35 FF=546.00 EL=546.00 N=740,372.21 E=997,885.90 E=997,942.87 No. DATE REVISION ISSUED FOR: PERMIT SET ISSUE DATE: JUNE 2024 APPROVED BY: CHECKED BY: DESIGNER: EL=546.50 G & O JOB NO.: 22260.00 RSVR_GRADE.DWG TWO INCHES AT FULL SCALE.
IF NOT, SCALE ACCORDINGLY CIVIL - MATCH EXISTING GRADE APPROXIMATELY 547.00 **RESERVOIR AND BOOSTER STATION GRADING PLAN** DRAWING: C2-7 OF: 8 MANZANITA RESERVOIR AND BOOSTER STATION PROPOSED GRADING PLAN SCALE: 1"=10'

Page 18 of 25 Gray & Osborne, Inc. 555 555 2102 CARRIAGE DRIVE SW, **BUILDING I** DOUBLE SWING -OLYMPIA, WA 98502 1 FENCE (TYP) GATE (TYP) CD-7 (360) 292-7481 ___ EG CROSS SECTION **550 550** CRUSHED CD-3 CRUSHED SURFACING FG CROSS SECTION 545 EG CROSS SECTION FG CROSS SECTION IMPORTED GRAVEL BORROW — OR SUITABLE NATIVE (TYP) 540 540 542.8 543.33 535 20+00 21+00 21+80 **BOOSTER STATION AND RESERVOIR CROSS SECTION** C2-7 SCALE H: 1"=10'-0" V: 1"=5'-0" RESERVOIR 7 RESERVOIR 2 555 555 SITE -CRUSHED CD-3 CRUSHED SURFACING **550** EG CROSS SECTION — **MASON COUNTY** PUD NO. 1 MANZANITA FG CROSS SECTION -545 RESERVOIR AND **BOOSTER PUMP** STATION 1681 E McREAVY RD UNION, WA 540 **540** IMPORTED GRAVEL - EG CROSS SECTION SUITABLE NATIVE (TYP) OR IMPORTED BÖRROW (TYP) GRAVEL BORROW FG CROSS SECTION 535 535 546.5 546.00 530 530 60÷00 61÷00 61+60 **BOOSTER STATION AND RESERVOIR CROSS SECTION** No. DATE REVISION SCALE H: 1"=10'-0" ISSUED FOR: V: 1"=5'-0" PERMIT SET ISSUE DATE: JUNE 2024 APPROVED BY: CHECKED BY: SLG 555 555 JPW DRAWN BY: GENERATOR SLG DESIGNER: G & O JOB NO.: 22260.00 RSVR_GRADE.DWG **550** 1 \FENCE BOOSTER ---STATION -CD-7 CD-3 CRUSHED SURFACING BUILDING FG CROSS SECTION TWO INCHES AT FULL SCALE IF NOT, SCALE ACCORDINGLY 545 545 **CIVIL** — EG CROSS SECTION — FG CROSS SECTION **540** SUITABLE NATIVE OR IMPORTED GRAVEL ----IMPORTED GRAVEL BÖRRÖW BORROW (TYP) 542.8 545.16 **RESERVOIR AND BOOSTER PUMP** 535 PROPOSED GRADING 70+00 71+00 **SECTIONS** 71÷60 **BOOSTER STATION AND** DRAWING: C2-8 OF: 8 **RESERVOIR CROSS SECTION** C2-7 SCALE H: 1"=10'-0" V: 1"=5'-0"

GENERAL NOTES FOR TARGETED DRAINAGE PLAN:

- ALL GRADING SHALL COMPLY WITH PERMIT CONDITIONS, CURRENT MASON COUNTY PUD AND MASON COUNTY CODES AND DEPARTMENT OF ECOLOGY REQUIREMENTS, AND STATE (WSDOT) STANDARD SPECIFICATIONS, CURRENT EDITION.
- 2. IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY THE CONTRACTOR'S ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES THAT MAY BE NEEDED TO PROTECT THE NATURAL FEATURES OR ADJACENT PROPERTIES.
- THE TEMPORARY EROSION/SEDIMENTATION CONTROL FACILITIES SHALL BE CONSTRUCTED PRIOR TO ANY GRADING OR SITE WORK. THESE FACILITIES MUST BE SATISFACTORILY MAINTAINED UNTIL CONSTRUCTION AND LANDSCAPING IS COMPLETED AND WITHIN 30 DAYS OF FINAL SITE STABILIZATION OR UNTIL THE POTENTIAL FOR ON-SITE EROSION HAS PASSED.
- 4. ALL PERSONS ENGAGING IN CONSTRUCTION ACTIVITIES SHALL PREVENT OR MINIMIZE EROSION AND SEDIMENTATION ON-SITE, AND SHALL PROTECT PROPERTIES AND WATER COURSES DOWNSTREAM FROM THE SITE.
- NON COMPLIANCE WITH THE EROSION CONTROL REQUIREMENTS, WATER QUALITY REQUIREMENTS AND/OR CLEARING LIMITS MAY RESULT IN REVOCATION OF PROJECT PERMITS, REVOCATION OF PLAN APPROVAL, AND BOND FORECLOSURES.
- PRIOR TO INITIATION OF SITE WORK, HIGHLY VISIBLE MARKERS SUCH AS ORANGE BARRIER FENCING OR FLAGGING SHALL BE USED TO IDENTIFY CLEARING LIMITS AND EXISTING NGPA AREAS.
- 7. ALL STREETS SHALL BE KEPT CLEAR OF DIRT AND DEBRIS DURING EXCAVATION AND FILL OPERATIONS. SWEEP STREETS IMMEDIATELY WHEN DIRT HAS BEEN TRACKED ONTO PAVED SURFACES.
- 8. STOCKPILES ARE TO BE LOCATED IN SAFE AREAS AND ADEQUATELY PROTECTED WITHIN 24 HOURS OF FORMATION TO PREVENT SOIL LOSS.
- 9. STORM SEWER INLETS RECEIVING SITE STORM WATER RUNOFF DURING CONSTRUCTION SHALL BE PROTECTED SO THAT WATER WILL NOT ENTER THE INLET WITHOUT FIRST BEING FILTERED OR OTHERWISE TREATED TO MINIMIZE THE AMOUNT OF SEDIMENT ENTERING THE INLET.
- 10. FROM MAY 1 TO SEPTEMBER 30, NO SOIL SHALL REMAIN EXPOSED FOR MORE THAN 7 DAYS. DENUDED AREAS SHALL BE COVERED BY MULCH, SOD, PLASTIC OR EQUIVALENT BMP LISTED IN THE WASHINGTON STATE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON FROM OCTOBER 1 TO APRIL 30. NO SOIL SHALL REMAIN EXPOSED FOR MORE THAN 2 DAYS. SEE WET SEASON SUPPLEMENTAL GRADING NOTES FOR ADDITIONAL BMP REQUIREMENTS.
- 11. WATER RESULTING FROM THE DEWATERING OF TRENCHES AND EXCAVATIONS SHALL BE FILTERED PRIOR TO DISCHARGE AS REQUIRED TO MEET TURBIDITY PERMITS. DISCHARGE OF SURFACE WATER FROM THE SITE SHALL BE SUBJECT TO MONITORING BY THE OWNER, AND TREATMENT AND/OR DIVERSION TO THE SANITARY SEWER SYSTEM WHERE APPROPRIATE, IN ACCORDANCE WITH THESE PLANS AND PROJECT SPECIFICATIONS. MAXIMUM ALLOWABLE TURBIDITY SHALL BE 5 NTU OVER BACKGROUND. DIVERSION OF STORM WATER DISCHARGE TO THE SANITARY SEWER SYSTEM SHALL BE SUBJECT TO OWNERS APPROVAL AND TO ANY PRE-TREATMENT REQUIREMENTS IMPOSED BY THE OWNER.
- 12. CONTRACTOR IS RESPONSIBLE FOR PREVENTING SURFACE WATER FROM RUNNING INTO EXCAVATIONS AND/OR PUMPING SURFACE RUN-OFF FROM EXCAVATION AND WORK AREA AS NEEDED.
- 13. FILTER FABRIC FENCE AND ALL OTHER TESC MEASURES SHALL BE CHECKED IMMEDIATELY AFTER EACH RAINFALL EVENT IN EXCESS OF 0.1 INCH AND DAILY DURING PROLONGED RAIN EVENTS. MAINTENANCE AND REPAIR OF TESC FACILITIES AND STRUCTURES SHALL BE CONDUCTED IMMEDIATELY UPON RECOGNITION OF A PROBLEM OR DAMAGE. SEE ALSO NOTES ON SILTATION BARRIER MAINTENANCE, THIS SHEET.
- 14. SEDIMENT DEPOSITS SHALL BE REMOVED FROM ALL TEMPORARY DRAINAGE FACILITIES AND STRUCTURES UPON REACHING A DEPTH OF 6 INCHES.
- 15. SUFFICIENT TEST BMP MATERIALS AND SUPPLIES TO PROTECT THE ENTIRE SITE SHALL BE STOCK PILED ON SITE.
- 16. CONSTRUCTION ACCEPTANCE WILL BE SUBJECT TO PLACEMENT OF STRAW OR WOOD FIBER MULCH OR EROSION CONTROL BLANKETS THAT FULFILLS THE REQUIREMENT OF THE APPROVED CONSTRUCTION PLANS AND MASON COUNTY DRAINAGE STANDARDS.
- 17. IMMEDIATELY FOLLOWING FINISH GRADING, PERMANENT VEGETATION SHALL BE APPLIED. ALL DISTURBED AREAS NOT DESIGNATED FOR OTHER SURFACE RESTORATION SHALL BE MULCHED WITH STRAW OR WOOD FIBER MATERIAL.
- 18. IF REQUIRED, SURFACE RUNOFF CONTROL MEASURES SUCH AS GRADIENT TERRACES, INTERCEPTOR DIKE/SWALES, LEVEL SPREADERS, AND SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO MULCHING.
- 19. TRANSPORT ALL EXCAVATED MATERIALS OFF SITE TO APPROVED STORAGE LOCATION, EXCEPT AS ALLOWED IN THE SPECIFICATIONS. LIMIT TRUCK ACTIVITY TO PAVED AND GRAVELED SURFACES ONLY. MAINTAIN TRUCK ACCESS AREAS WHERE CLEAR OF DIRT AND SEDIMENT DURING PERIODS OF TRUCK ACTIVITY BY SWEEPING.
- 20. ADDITIONAL REQUIREMENTS FOR UTILITIES. THE INSTALLATION OF UNDERGROUND UTILITY LINES SHALL BE SUBJECT TO THE FOLLOWING ADDITIONAL REQUIRMENTS:
- a. NO MORE THAN FIVE HUNDRED (300) FEET OF TRENCH MAY REMAIN OPEN AT ONE TIME;
- b. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF THE TRENCHES UNLESS INCONSISTENT WITH SAFETY OR SITE CONSTRAINTS

CONSTRUCTION SEQUENCE:

- 1. ATTEND PRE-CONSTRUCTION MEETING.
- 2. FLAG OR FENCE CLEARING LIMITS.
- 3. INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.)
- CONSTRUCT SURFACE WATER CONTROLS IF NEEDED (INTERCEPTOR DIKES, STRAW WATTLES, ETC.) SIMULTANEOUSLY WITH CLEARING AND GRADING FOR WATER MAIN CONSTRUCTION
- MAINTAIN EROSION CONTROL MEASURES IN ACCORDANCE WITH COUNTY REQUIREMENTS AND MANUFACTURER'S RECOMMENDATIONS.
- 6. 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 COUNTY REQUIREMENTS.
- 7. COVER ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN TWO DAYS BETWEEN OCTOBER 1ST AND APRIL 30TH OR SEVEN DAYS BETWEEN MAY 1ST AND SEPTEMBER 30TH WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING OR EQUIVALENT.
- 8. STABILIZE ALL AREAS WITHIN SEVEN DAYS OF REACHING FINAL GRADE.
- 9. PLACE STRAW OR FIBER MULCH ON ANY AREAS TO REMAIN UNWORKED FOR MORE THAN 30 DAYS.
- 10. UPON COMPLETION OF THE PROJECT, STABILIZE ALL DISTURBED AREAS AND REMOVE BMPS WHEN APPROPRIATE.

WET SEASON SUPPLEMENTAL GRADING NOTES (OCTOBER 1 THROUGH APRIL 30)

- CONSTRUCTION SEQUENCE SHALL BE MODIFIED TO MINIMIZE THE AREA OF UNSTABILIZED SOIL, WITH A MAXIMUM OF 1,000 SQUARE FEET EXPOSED AT ANY TIME.
- 2. EARTHEN AREAS WITH THE POTENTIAL TO CONTRIBUTE SEDIMENTS DURING STORM EVENTS AND WHERE EARTH MOVEMENT IS NOT ANTICIPATED WITHIN 48-HOURS SHALL BE STABILIZED USING ONE OR MORE OF THE FOLLOWING BMPS INSTALLED IN ACCORDANCE WITH THE CURRENT MASON COUNTY DRAINAGE MANUAL: STRAW MULCH OF 4" THICKNESS, PLASTIC SHEETING, EROSION CONTROL BLANKETS.
- 3. WET SEASON TEST MEASURES SHALL BE EXPANDED TO INCLUDE
- a. IMPLEMENT A PLAN TO PUMP TURBID WATER TO THE SANITARY SEWER SYSTEM OR TO PUMP TO ON SITE TANKS AND TREAT PRIOR TO DISCHARGE TO THE STORM SYSTEM. THE PLAN SHALL BE PRE-APPROVED BY THE OWNER PRIOR TO START OF WET SEASON GRADING AND SHALL BE SUBJECT TO MONITORING BY THE OWNER AS DESCRIBED IN THE SPECIFICATIONS. PUMPING TO THE SANITARY SEWER SYSTEM SHALL REQUIRE OWNERS APPROVAL AND SHALL BE SUBJECT TO SUCH CONDITIONS AS THE OWNER MAY IMPOSE, AS DESCRIBED IN THE SPECIFICATIONS.
- b. STOCKPILE BUILDING MATERIALS ON PAVED AND/OR GRAVELED SURFACES TO MINIMIZE TRAFFIC ON ERODABLE SURFACES.
- 4. SOILS SHALL NOT BE DISTURBED EXCEPT FOR CONSTRUCTION ACTIVITIES. PARKING IS ALLOWED ONLY ON PAVED AND/OR GRAVELED SURFACES.
- 5. SLOPES WITHOUT ESTABLISHED GROUND COVER SHALL BE STABILIZED WITH PLASTIC SHEETING, 6 MIL. MINIMUM. SHEETING SHALL BE ANCHORED WITH SANDBAGS LOCATED 5 FEET APART ON THE PERIMETER AND 10 FEET ON CENTER ELSEWHERE ON THE SHEETING. A MINIMUM OF 2 FEET OVERLAP IS REQUIRED FOR OVERLAPPING SHEETS.
- 6. WHEN RAINFALL IS HEAVY (DEFINED AS SUFFICIENT TO PRODUCE SEDIMENT RUNOFF FROM EXPOSED DIRT), ALL EXPOSED EARTHWORK SHALL BE COVERED. NO OTHER CONSTRUCTION ACTIVITY SHALL OCCUR ON PERVIOUS SURFACES DURING THESE PERIODS OF HEAVY RAINFALL.
- 7. ALL DRAINAGE SWALES AND AREAS WITH 2:1 OR GREATER SLOPES SHALL BE LINED WITH STAKED EROSION CONTROL BLANKETS.

CLEAR PLASTIC COVERINGS:

- 1. CLEAR PLASTIC COVERINGS SHALL HAVE A MINIMUM THICKNESS OF 6 MIL AND MEET THE REQUIREMENTS OF WSDOT/APWA SECTION 9-14.5.
- 2. COVERING SHALL BE INSTALLED AND MAINTAINED TIGHTLY IN PLACE BY USING SANDBAGS OR TIRES OR ROPES WITH A MAXIMUM 10 FOOT GRID SPACING IN ALL DIRECTIONS. ALL SEAMS SHALL BE TAPED OR WEIGHTED DOWN FULL LENGTH AND THERE SHALL BE AT LEAST A 1 TO 2 FOOT OVERLAP OF ALL SEAMS. SEAMS SHOULD THEN BE ROLLED AND STAKED OR TIED.
- 3. WHEN THE COVERING IS USED ON BARE SOIL SLOPES, IT SHALL BE LEFT IN PLACE UNTIL STRAW OR WOOD FIBER MULCH IS APPLIED.
- 4. SHEETING SHOULD BE TOED IN AT THE TOP OF THE SLOPE TO PREVENT SURFACE FLOW BENEATH THE PLASTIC.
- 5. SHEETING SHOULD BE REMOVED AS SOON AS IS POSSIBLE TO PREVENT BURNING THE VEGETATION.
- 6. CHECK SHEETING REGULARLY FOR RIPS AND PLACES WHERE THE PLASTIC MAY BE DISLODGED. CONTACT BETWEEN THE PLASTIC AND THE GROUND SHOULD ALWAYS BE MAINTAINED. ANY AIR BUBBLES FOUND SHOULD BE REMOVED IMMEDIATELY OR THE PLASTIC MAY RIP DURING THE NEXT WINDY PERIOD. RE-ANCHOR OR REPLACE THE PLASTIC AS NECESSARY.

FILTER FENCE:

- 1. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6 INCH OVERLAP, AND BOTH ENDS SECURELY FASTENED TO THE POST.
- 2. POSTS SHALL BE SPACED A MAXIMUM OF 6 FEET APART AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 30 INCHES (WHERE PHYSICALLY POSSIBLE).
- A TRENCH SHALL BE EXCAVATED APPROXIMATELY 8 INCHES WIDE AND 8 INCHES DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER. THE TRENCH SHALL BE CONSTRUCTED TO FOLLOW THE CONTOUR.
- WHEN SILT FILM FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING TIE WIRES, HOG RINGS, OR HEAVY-DUTY WIRE STAPLES AT LEAST 1 INCH LONG. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4 INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
- 5. SILT FILM FILTER FABRIC SHALL BE WIRED TO THE FENCE, AND 20 INCHES OF THE FABRIC SHALL EXTEND INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES. OTHER TYPES OF FABRIC MAY BE STAPLED TO THE FENCE.
- 6. WHEN EXTRA-STRENGTH OR MONOFILAMENT FABRIC AND CLOSER POST SPACING ARE USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF FILTER FENCE NOTE 5 APPLYING. EXTRA CARE SHOULD BE USED WHEN JOINING OR OVERLAPPING THESE STIFFER FABRICS.
- 7. THE BASE OF THE SILT FENCE SHALL BE SECURED WITH COMPACTED NATIVE SOIL OR 3/4" MIN DIA WASHED GRAVEL. THE MATERIAL SHALL BE WELL BEDDED TO ENSURE GOOD CONTACT BETWEEN THE FABRIC AND THE TRENCH BOTTOM.
- 8. FILTER FABRIC FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED. RETAINED SEDIMENT MUST BE REMOVED AND PROPERLY DISPOSED OF AND MULCHED.

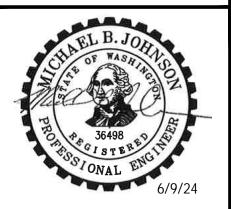
FILTER FENCE MAINTENANCE

- 1. INSPECT IMMEDIATELY AFTER EACH RAINFALL, AND AT LEAST DAILY DURING PROLONGED RAINFALL. REPAIR AS NECESSARY.
- SEDIMENT MUST BE REMOVED WHEN IT REACHES APPROXIMATELY ONE THIRD THE HEIGHT OF THE FENCE, ESPECIALLY IF HEAVY RAINS ARE EXPECTED.
- ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE FILTER FENCE IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED AND MULCHED.
- 4. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY "BEST MANAGEMENT PRACTICES" ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON SITE. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED.



OLYMPIA. WA 98502

(360) 292-7481





PUD NO. 1 MANZANITA RESERVOIR AND BOOSTER PUMP STATION 1681 E McREAVY RD UNION, WA

No. DATE REVISION
ISSUED FOR:

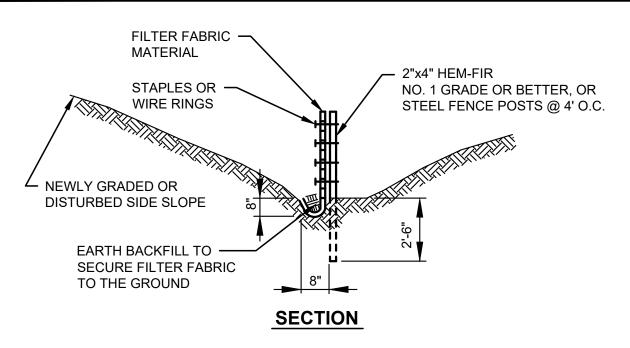
PERMIT SET
ISSUE DATE: JUNE 2024
APPROVED BY: MBJ
CHECKED BY: SLG
DRAWN BY: JPW
DESIGNER: SLG
G & O JOB NO.: 22260.00
FILE: DETAILS.DWG

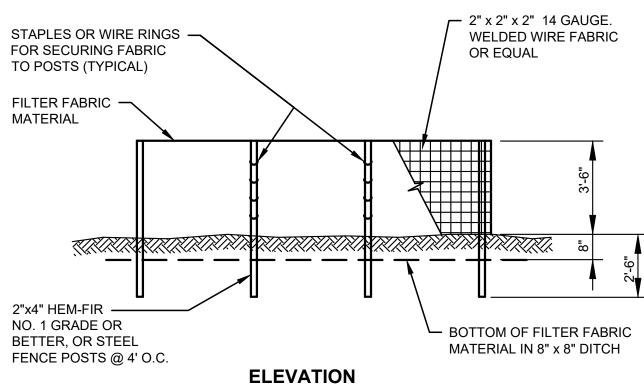
CIVIL DETAILS

TESC NOTES

DRAWING: CD-1 OF: 7

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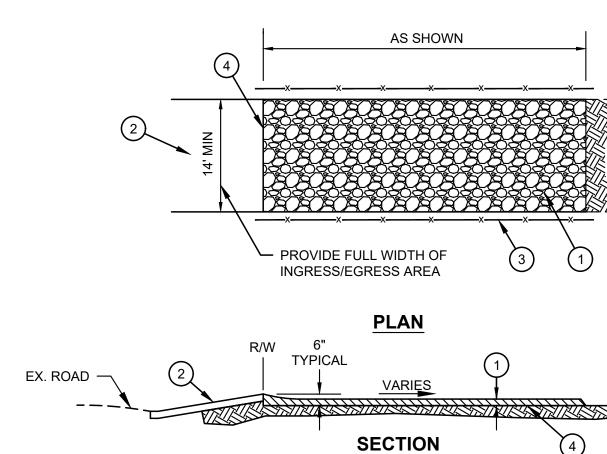




<u>NOTES</u>

- 1. WHERE POSSIBLE, MAINTAIN NATURAL VEGETATION FOR SILT CONTROL
- 2. TEMPORARY SILTATION CONTROL SHALL BE CONSTRUCTED BY PLACING FILTER FABRIC FENCES ACROSS SWALES UTILIZING FILTER SYSTEM PRIOR TO DISCHARGE
- 3. BE MAINTAINED IN A SATISFACTORY CONDITION UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND SURFACE RESTORATION HAS BEEN COMPLETED
- 4. RETURN SILTATION CONTROL AREAS TO ORIGINAL GROUND CONDITIONS, UNLESS SPECIFICALLY DIRECTED OTHERWISE BY THE ENGINEER





GENERAL NOTES:

DETAIL NOTES:

- 4" TO 8" QUARRY SPALLS AS SPECIFIED IN SECTION 9-13.6 OF THE WSDOT STANDARD SPECIFICATIONS.
- 2 ATB DRIVEWAY RAMP, OR SITE ACCESS ROAD. QUARRY SPALL ENTRANCE WIDTH AND LENGTH PER PLAN.
- 3 INSTALL ORANGE BARRIER FENCE TO DIRECT TRAFFIC ONTO CONSTRUCTION ENTRANCE.
- 4 FILTER FABRIC (GEOTEXTILE FABRIC) SHALL BE INSTALLED BENEATH THE ENTIRE CONSTRUCTION ENTRANCE AND SHALL CONFORM TO THE FOLLOWING PROPERTIES:

PROPERTY	<u>UNIT</u>	TEST METHOD	RESULT	
WEIGHT	OZ/SY	ASTM D3776	2.5 MIN.	
THICKNESS	MILS	ASTM D1776	15 MIN.	
GRAB STRENGTH	LB	ASTM D1682	100 MIN.	
UV RESISTANCE	%	ASTM D1682	90 MIN.	
RETENTION EFFICIENCY	%	VIRGINIA DOT VTM-51	75 MIN.	
EQUIVALENT SIZE	U.S. STD. SIEVE	COE CW 02215	20	
OPENING				

- 1. INSTALLATION THE AREA OF THE ENTRANCE SHALL BE CLEARED OF ALL VEGETATION, ROOTS AND OTHER OBJECTIONABLE MATERIAL. THE GRAVEL SHALL BE PLACED TO THE SPECIFIED DIMENSIONS. ANY DRAINAGE FACILITIES REQUIRED BECAUSE OF WASHING SHOULD BE CONSTRUCTED ACCORDING TO SPECIFICATIONS IN THE PLAN. IF WASH RACKS ARE USED, THEY SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
- 2. SURFACE WATER ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A DRIVABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
- 3. MAINTENANCE THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY.
 THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY.
- 4. WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS USED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
- 5. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.



LB ASTM D1682 100 MIN.

% ASTM D1682 90 MIN.

% VIRGINIA DOT VTM-51 75 MIN.

U.S. STD. SIEVE COE CW 02215 20

36498

ONAL ENGINE

Gray & Osborne, Inc.

2102 CARRIAGE DRIVE SW,

BUILDING I

OLYMPIA, WA 98502

(360) 292-7481



MASON COUNTY
PUD NO. 1
MANZANITA
RESERVOIR AND
BOOSTER PUMP
STATION
1681 E MCREAVY RD

UNION, WA

No. DATE REVISION

ISSUED FOR:

PERMIT SET

ISSUE DATE: JUNE 2024

APPROVED BY: MBJ

CHECKED BY: SLG

DRAWN BY: JPW

DESIGNER: SLG

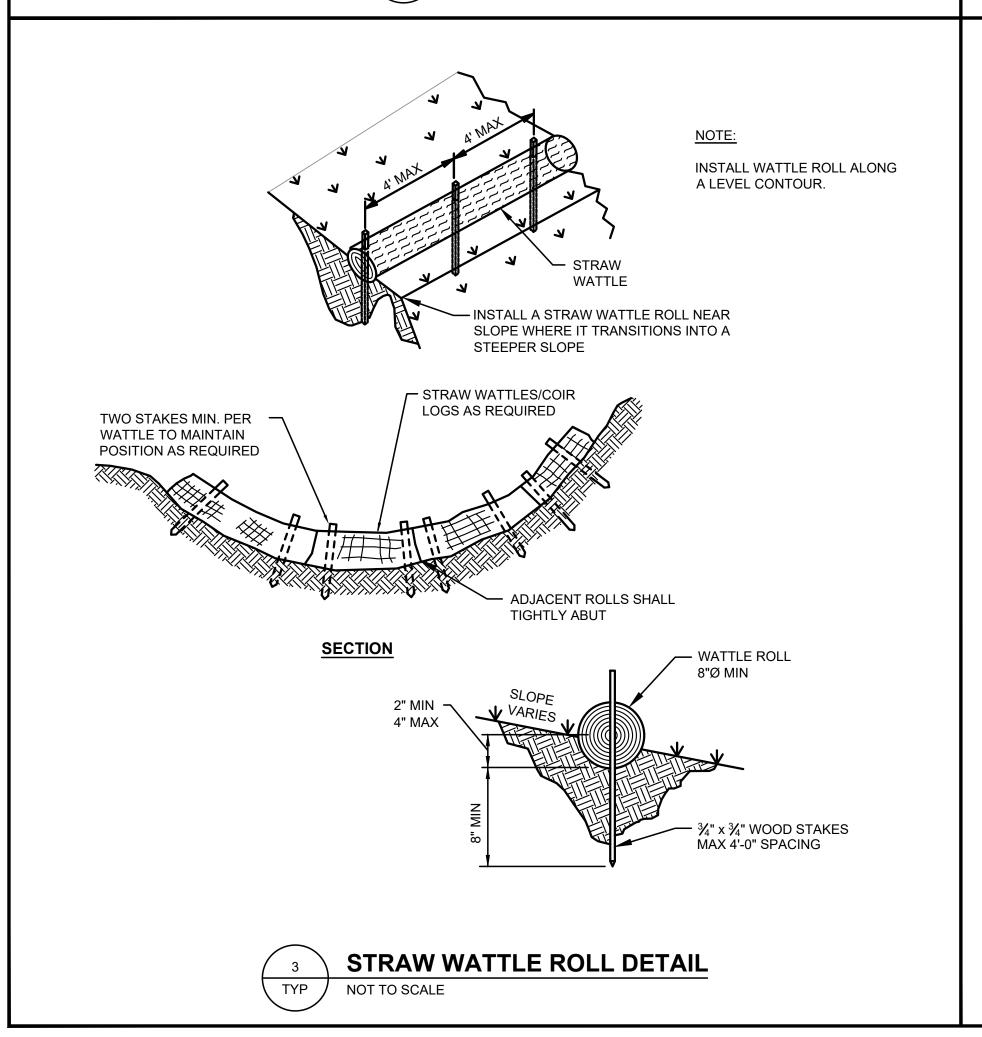
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DETAILS.DWG

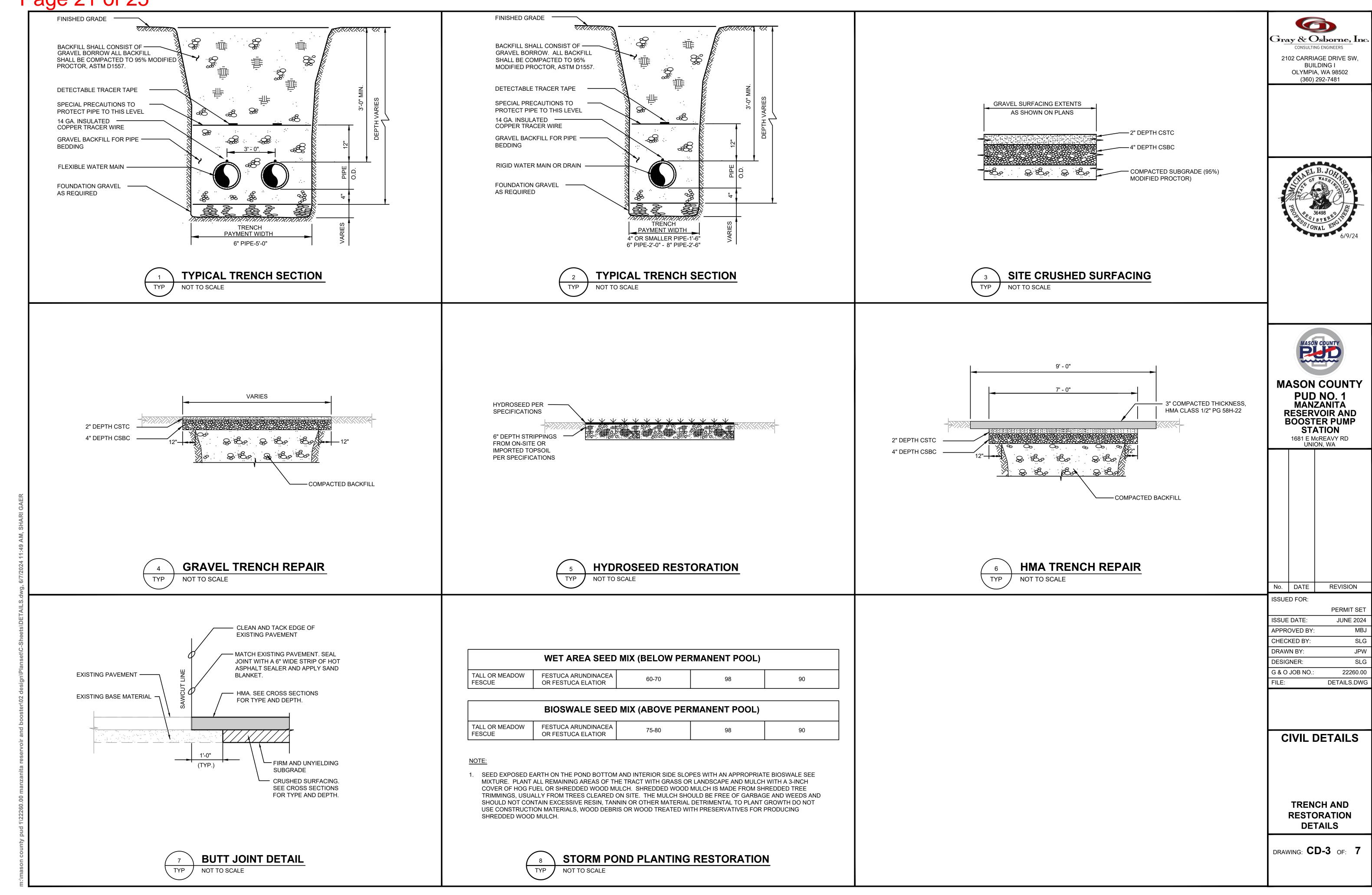
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TESC DETAILS

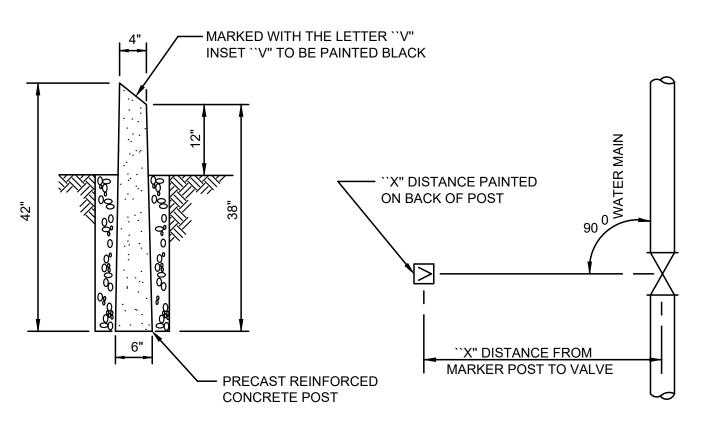
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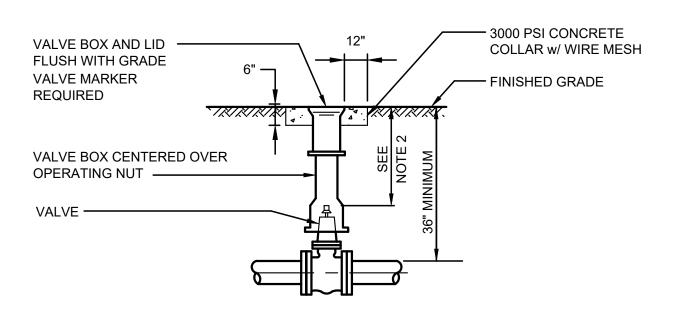


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NOTES:

- 1. PRECAST REINFORCED POST TO BE PAINTED FLAT TRAFFIC YELLOW #2612 OR SAFETY YELLOW #1063.
- 2. THE DISTANCE FROM THE MARKER POST TO THE WATER MAIN SHALL BE PAINTED ON THE BACKSIDE OF THE MARKER POST IN BLACK WITH A 2" HIGH NUMBER.
- 3. VALVE MARKER POST SHALL BE REQUIRED WHENEVER THE WATER VALVE IS LOCATED IN AN UNPAVED AREA.
- 4. THE POST WILL ALSO BE REQUIRED FOR BLOW-OFF IN THE SAME CONDITION AS WATER VALVES.



VALVE BOX IN UNIMPROVED AREA (VALVE MARKER REQUIRED)

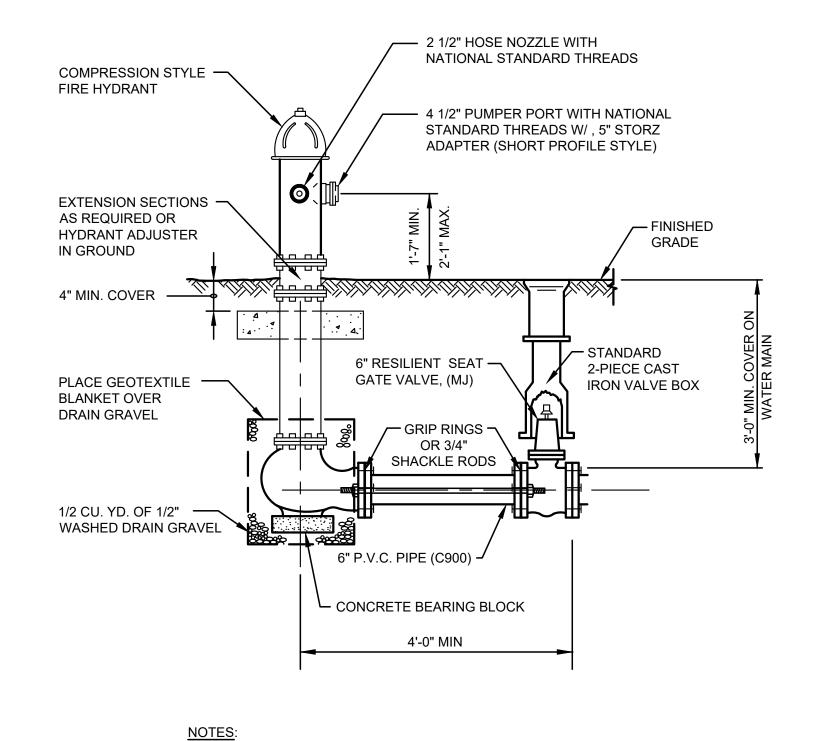
NOTES:

1. EACH VALVE SHALL BE PROVIDED WITH AND ADJUSTABLE CAST IRON VALVE BOX OF 5 INCHES (5") INSIDE DIAMETER. VALVE BOXES SHALL HAVE A TOP SECTION WITH AN EIGHTEEN INCH (18") MIN. LENGTH. THE VALVE BOX SHALL BE RICH No. 940 OR EQUAL. VALVE BOX EARS SHALL BE PLACED IN LINE WITH PIPE IT SERVES.

VALVE BOX

NOT TO SCALE

2. 18" MINIMUM, 24" MAXIMUM DEPTH TO OPERATOR NUT PROVIDE EXTENSION IS REQUIRED.



- 1. PROVIDE MIN. 3'-0" CLEARANCE AND LEVEL AREA AROUND HYDRANT.
- 2. PAINT FIRE HYDRANT WITH TWO COATS OF YELLOW RUST-RESISTANT PAINT.
- 3. ACCEPTABLE HYDRANTS: MUELLER CENTURION.





Gray & Osborne, Inc.

2102 CARRIAGE DRIVE SW, BUILDING I

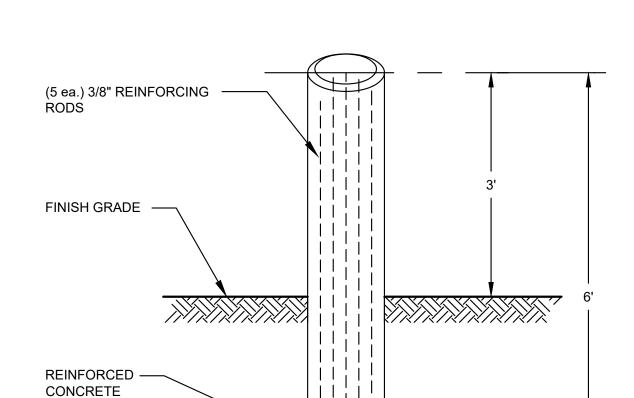
OLYMPIA, WA 98502

(360) 292-7481

MASON COUNTY
PUD NO. 1
MANZANITA
RESERVOIR AND
BOOSTER PUMP
STATION
1681 E MCREAVY RD

UNION, WA

1 VALVE MARKER POST TYP NOT TO SCALE



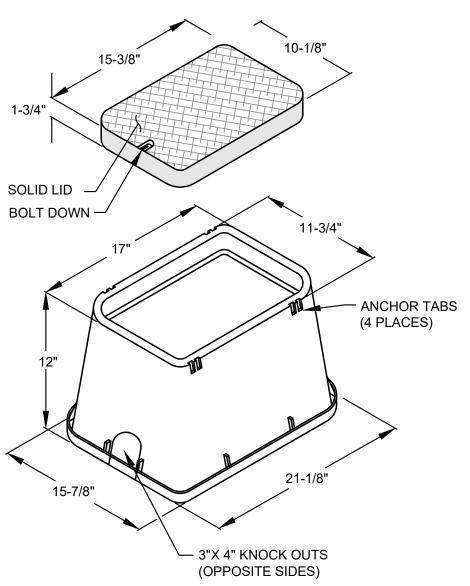
NOTES:

1. HYDRANTS POSTS SHALL CONSIST OF REINFORCED 9" DIA. PRECAST UNIT SPECIFICALLY MANUFACTURED FOR PROTECTION OF HYDRANTS.

→ 9" DIA.

- 2. THE CONFIGURATION OF THE GUARD POST WILL BE 2, 3, OR 4 EACH HYDRANT AND SHALL BE DETERMINED BY THE DISTRICT BASED ON FIELD CONDITIONS.
- 3. HYDRANT GUARD POSTS SHALL BE PAINTED WITH TWO (2) COATS OF "STEELCOTE FEDERAL YELLOW" PAINT.

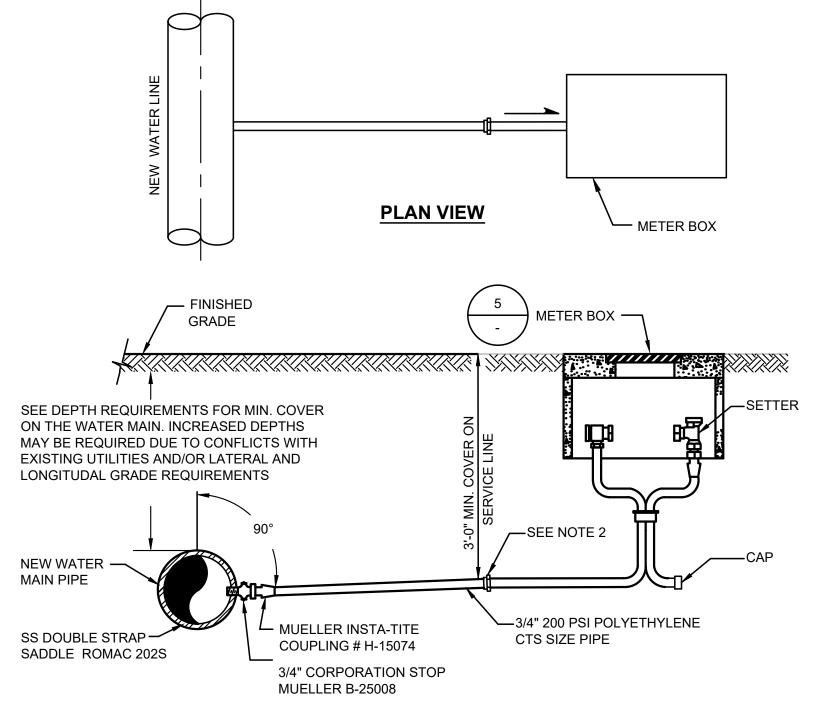




NOTE:

 CARSON MODEL 1419 W/ METER READING COVER OR EQUAL COVER MUST DISPLAY "W.M." OR EQUAL.





CIVIL DETAILS

No. DATE

ISSUED FOR:

ISSUE DATE:

APPROVED BY:

CHECKED BY:

DRAWN BY:

DESIGNER:

G & O JOB NO.:

REVISION

PERMIT SET

JUNE 2024

SLG

JPW

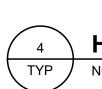
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22260.00

DETAILS.DWG

WATER DETAILS

DRAWING: CD-4 OF: 7

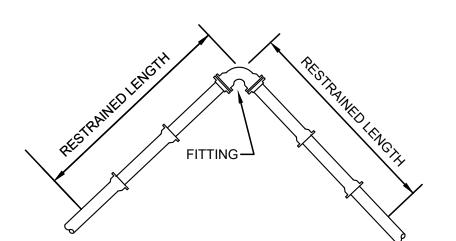


HYDRANT GUARD POST

YP NOT TO SCALE

6 SAMPLE STATION
TYP NOT TO SCALE

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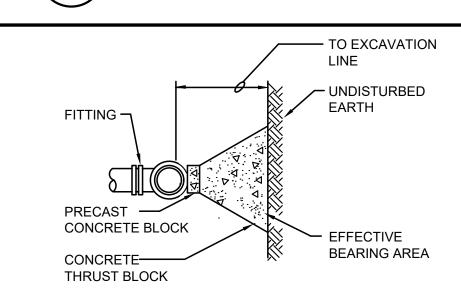


PIPE SIZE	90° 45° BEND BEND		22 1/2° BEND
	RESTRAI	NED LENGTH (ONE SIDE)	I IN FEET
6"	30	13	6

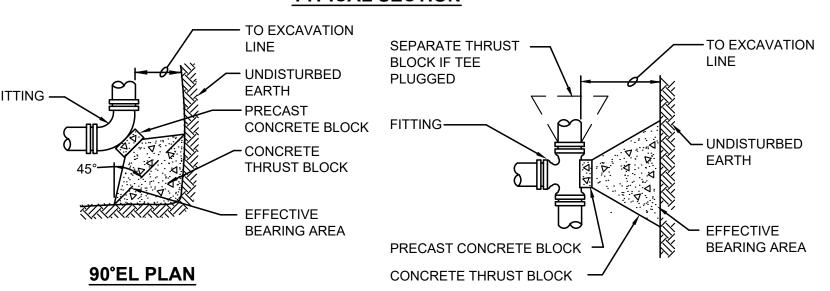
NOTES:

- 1. RESTRAINED JOINT PIPE AND FITTINGS MAY BE USED IN LIEU OF THRUST BLOCKS IF RESTRAINED JOINT PIPE IS USED, THE CONTRACTOR SHALL RESTRAIN JOINTS FOR THE DISTANCES SHOWN IN THE ABOVE TABLES.
- 2. RESTRAINED LENGTHS SHOWN ARE MINIMUM AND FOR LINEAL FEET REQUIRED ON EACH SIDE OF FITTING INDICATED.
- 3. FOOTAGES ARE BASED ON 250 PSI PRESSURE AND 36" INCHES COVER. IF PRESSURE IS GREATER OR COVER IS LESS, THE RESTRAINED LENGTH SHALL BE INCREASED.

ALTERNATIVE THRUST RESTRAINT NOT TO SCALE



TYPICAL SECTION



TEE PLAN

3 SQ. FT.

DISTANCE ``MAY" BE GREATER THAN 3 FT. TO ACCOMMODATE

MIN. COVER AND VERTICAL CLEARANCE

CONTRACTOR SHALL VERIFY LOCATION AND

2' MINIMUM BETWEEN GAS,

10' MINIMUM BETWEEN SEWER

POWER & TELEPHONE

DEPTH OF EXISTING

AND/OR PROPOSED

UTILITIES

FINISHED GROUND

EXISTING—

PROPOSED WATER MAIN- SPACE
JOINTS EQUAL DISTANCE

NOT TO SCALE

FROM CROSSING

UTILITY LINES

TYPICAL UTILITY CROSSING

EFFECTIVE BEARING AREA REQUIRED						
FITTING D TEE 90° 45° 22 1/2° 11 1/4°						
3"	4 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.	2 SQ. FT.	
4"	4 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.	2 SQ. FT.	
6"	4 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.	2 SQ. FT.	

6 SQ. FT.

TYPICAL FOR SANDY SOIL WITH 2,000 P.S.F. BEARING STRENGTH & 100 P.S.I. WORKING PRESSURE.

ADJUST BEARING AREA BY PRESSURE & SOIL BEARING CAPACITY. USE TEE FOR DEAD ENDS.

1. BLOCKING SHALL BE TO SOLID BEARING SURFACE.

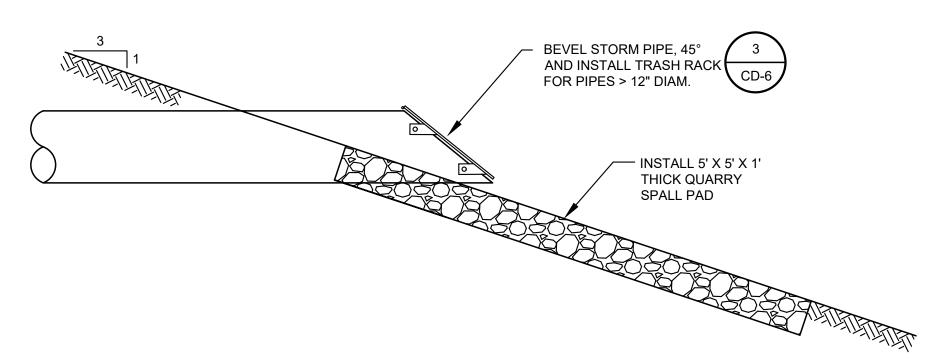
7 SQ. FT.

- 2. FITTING SHALL BE PROTECTED WITH A POLYTHENE ENCASEMENT.
- 3. BEARING SHALL BE PROPORTIONALLY INCREASED WITH PRESSURES IN EXCESS OF 100

10 SQ. FT.

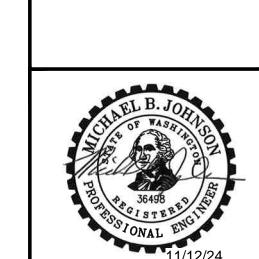
- P.S.I OR IN SOIL CONDITIONS WITH LESS THAN 2,000 P.S.F BEARING STRENGTH.
- 4. ALL BLOCKS ON TEES SHALL BE SEPARATED FOR DIRECTION OF THRUST.





BUILDING AND VAULT DRAIN AND RESERVOIR OVERFLOW DRAIN OUTLET



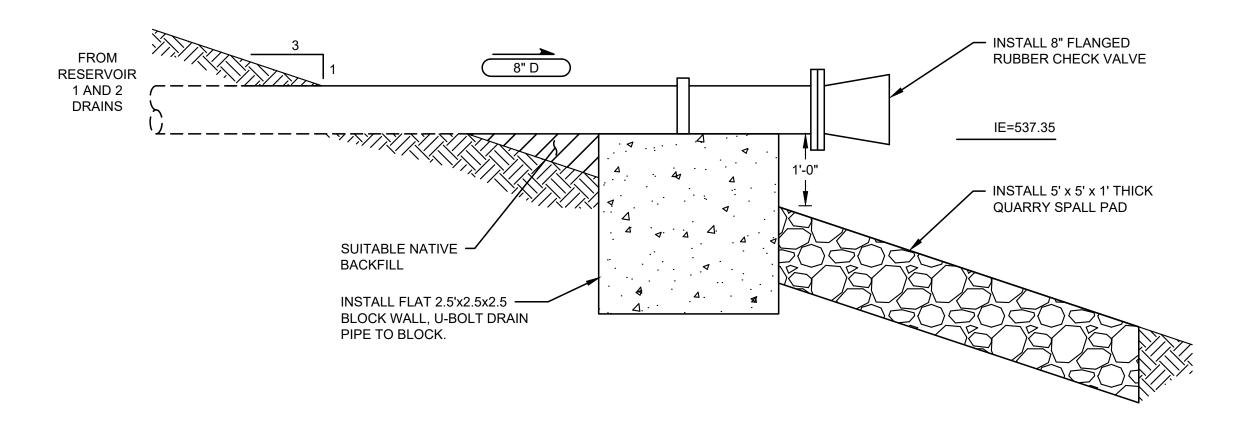


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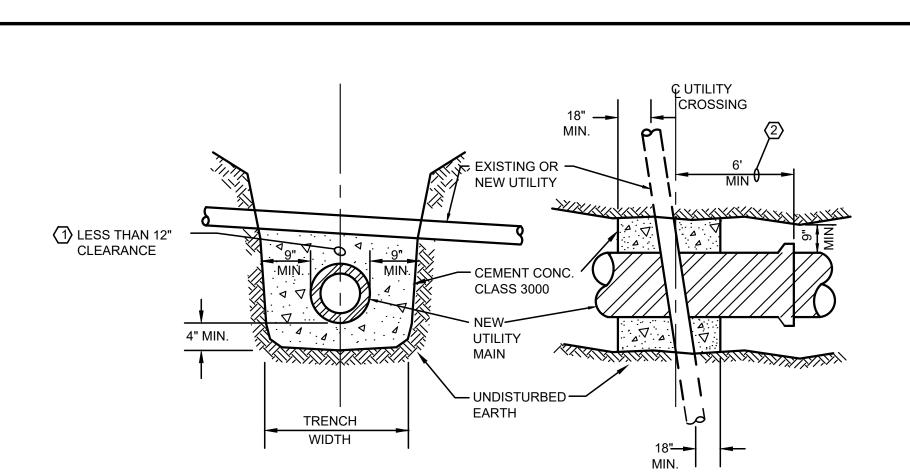
2102 CARRIAGE DRIVE SW,

BUILDING I

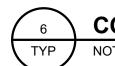
OLYMPIA, WA 98502 (360) 292-7481







- 1. CONTRACTOR SHALL PROVIDE CONCRETE PIPE ENCASEMENT AT ALL EXISTING UTILITY CROSSINGS IN THE EVENT THAT A 12" SEPARATION CANNOT BE PROVIDED. THE CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE SITE UTILITIES TO ANTICIPATE PROVIDING AND INSTALLING CONCRETE ENCASEMENTS WHERE NECESSARY.
- 2. CONTRACTOR SHALL NOT CONSTRUCT ANY NEW PIPE JOINT WITHIN 6 FEET OF THE EXISTING CENTERLINE OF THE UTILITY CROSSING.



CONCRETE PIPE ENCASEMENT DETAIL

NOT TO SCALE

ı	I	

MASON COUNTY

PUD NO. 1

MANZANITA

RESERVOIR AND

BOOSTER PUMP

STATION

1681 E McREAVY RD UNION, WA

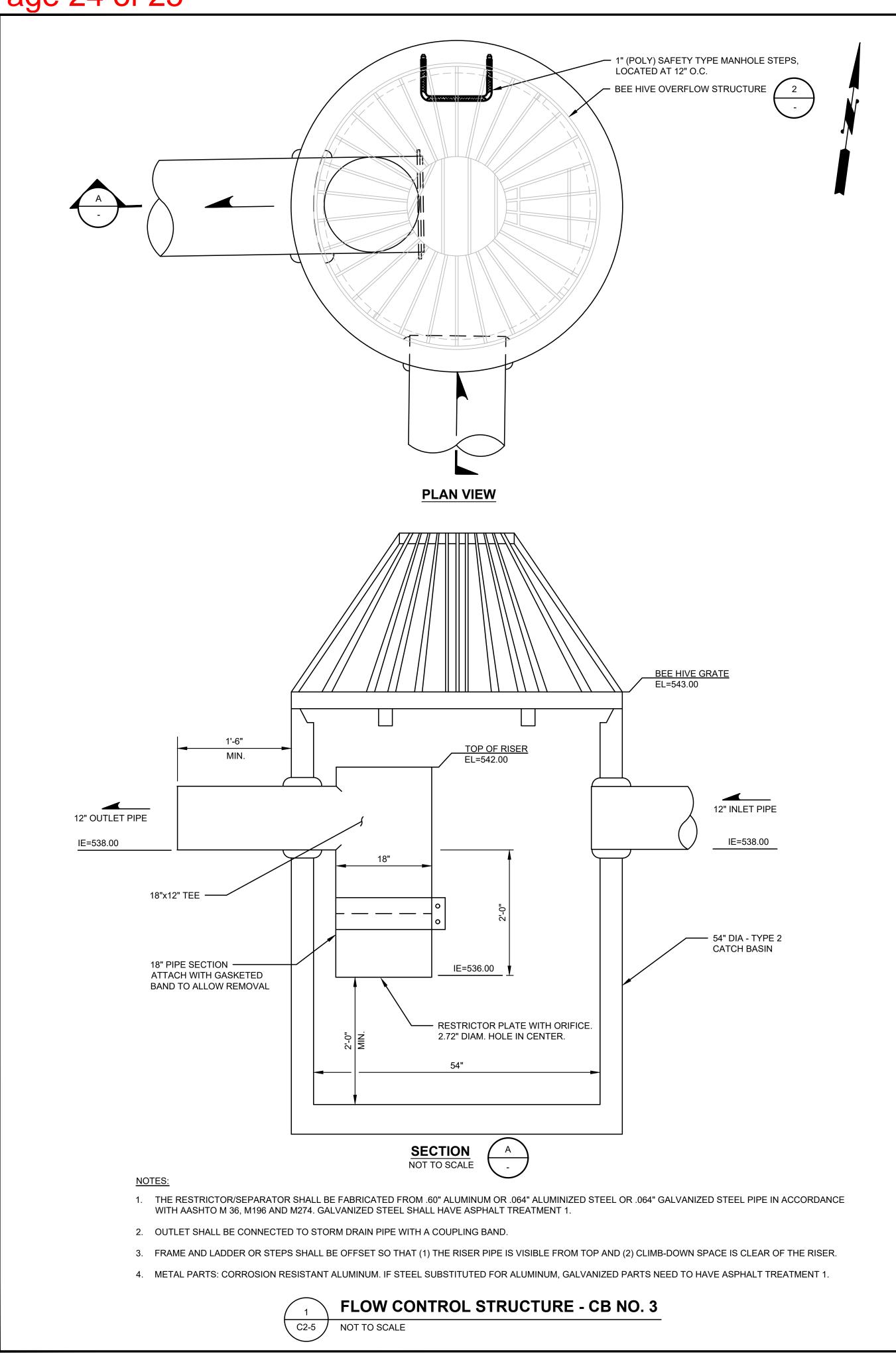
No. DATE REVISION ISSUED FOR: PERMIT SET ISSUE DATE: NOVEMBER 2024 APPROVED BY: CHECKED BY: SLG DRAWN BY: JPW DESIGNER: SLG G & O JOB NO.: 22260.00 DETAILS.DWG

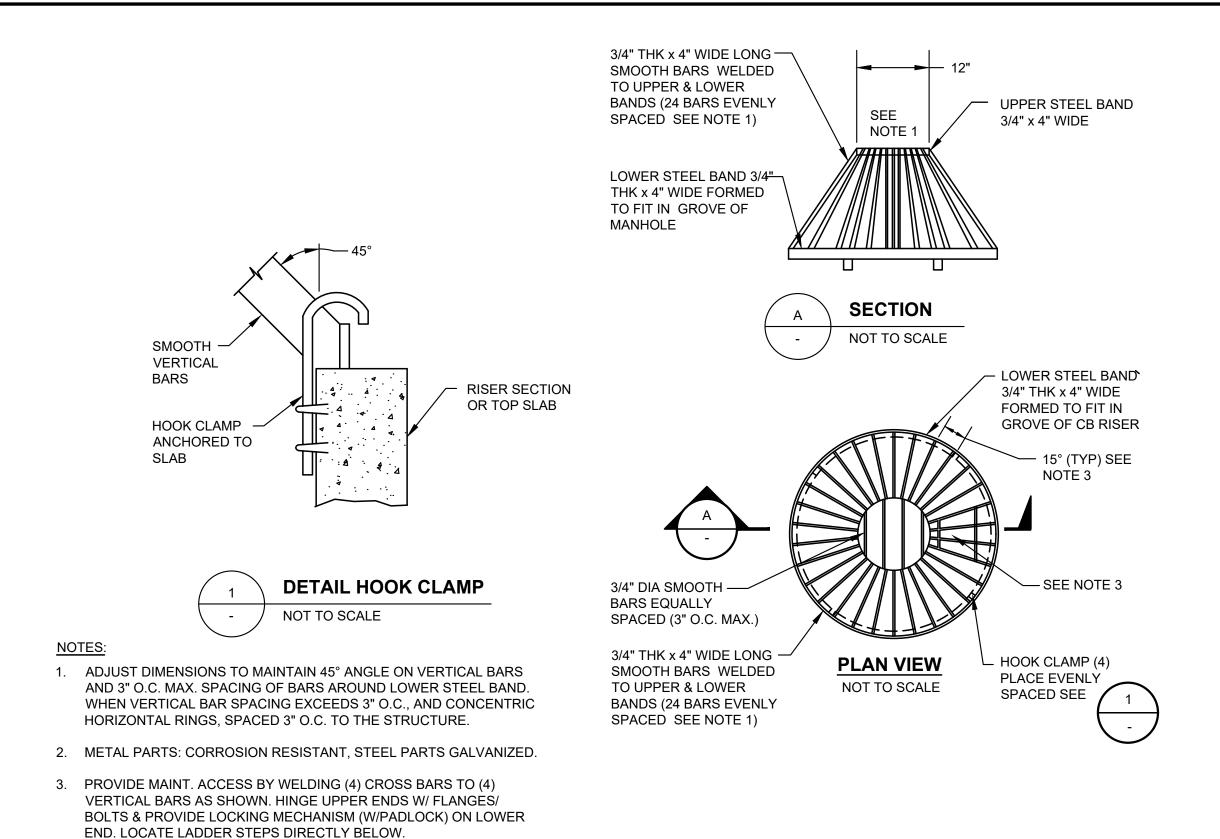
CIVIL DETAILS

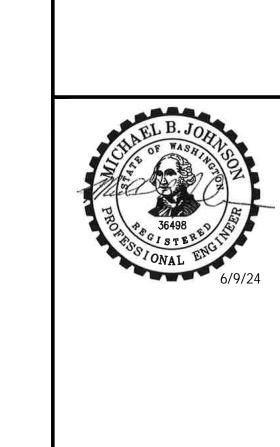
DRAINAGE AND **MISCELLANEOUS DETAILS**

DRAWING: CD-5 OF: 7

Page 24 of 25







MASON COUNTY

PUD NO. 1 MANZANITA RESERVOIR AND

BOOSTER PUMP STATION

1681 E McREAVY RD

No. DATE

ISSUED FOR:

ISSUE DATE:

APPROVED BY:

CHECKED BY:

DRAWN BY:

DESIGNER:

G & O JOB NO.:

REVISION

PERMIT SET

JUNE 2024

SLG

JPW

SLG

22260.00

DETAILS.DWG

UNION, WA

Gray & Osborne, Inc.

2102 CARRIAGE DRIVE SW,

BUILDING I

OLYMPIA, WA 98502 (360) 292-7481



9" 3" 6" CLEAR FROM DEBRIS BARRIER TO FINISHED GRADE

ROLLED SMOOTH
FLOW

1/4"x2" F.B. ANCHOR STRAPS FASTEN WITH 1/2" GALVANIZED OR NON-CORROSIVE BOLTS & NUTS (TYP, 4 PLACES).

ALUMINUM TRASH RACK

NOTES:

☐ INSERT ALUMINUM TRASH RACK INTO

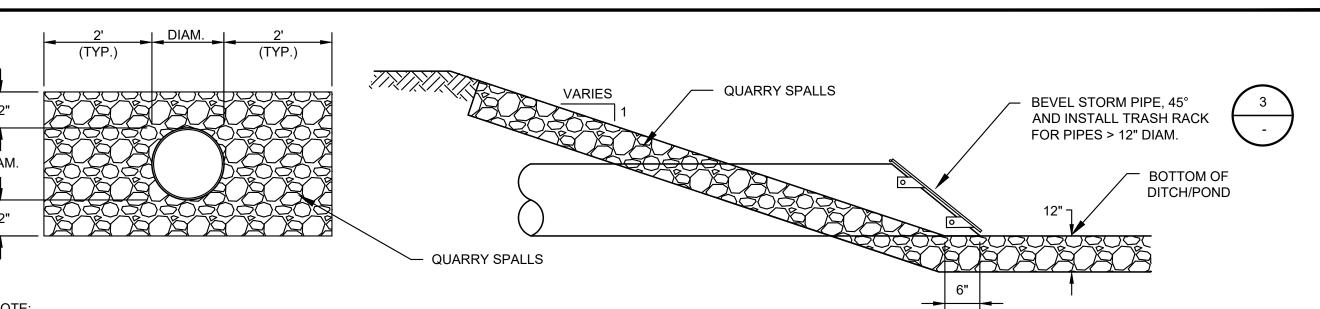
PIPE END.

- 3/4" DIAM. BAR FRAME

REMOVABLE RACK 1/2" SCH 40 ALUM. PIPE (3/4" O.D.) 6" O.C.

- 1. ALL STEEL PARTS MUST BE GALVANIZED & ASPHALT COATED (TREATMENT 1 OR BETTER).
- 2. CONTRACTOR TO VERIFY DIMENSIONS.





NOTE:

1. QUARRY SPALLS SHALL CONFORM TO SECTION 9-13 OF THE WSDOT STANDARD SPECIFICATIONS. MATERIALS USED FOR QUARRY SPALLS SHALL MEET THE REQUIREMENT OF SECTION 9-13.1(5) IF THE WSDOT STANDARD SPECIFICATIONS, EXCEPT THAT THE SIZE OF MATERIAL SHALL BE REVISED AS FOLLOWS: 100 PERCENT PASSING A 4-INCH SIEVE SIZE AND 40 PERCENT PASSING A 2-INCH SIEVE SIZE.



STORM PIPE INLET/OUTLET PROTECTION DETAIL

CIVIL DETAILS

STORMWATER DETAILS

DRAWING: CD-6 OF: 7

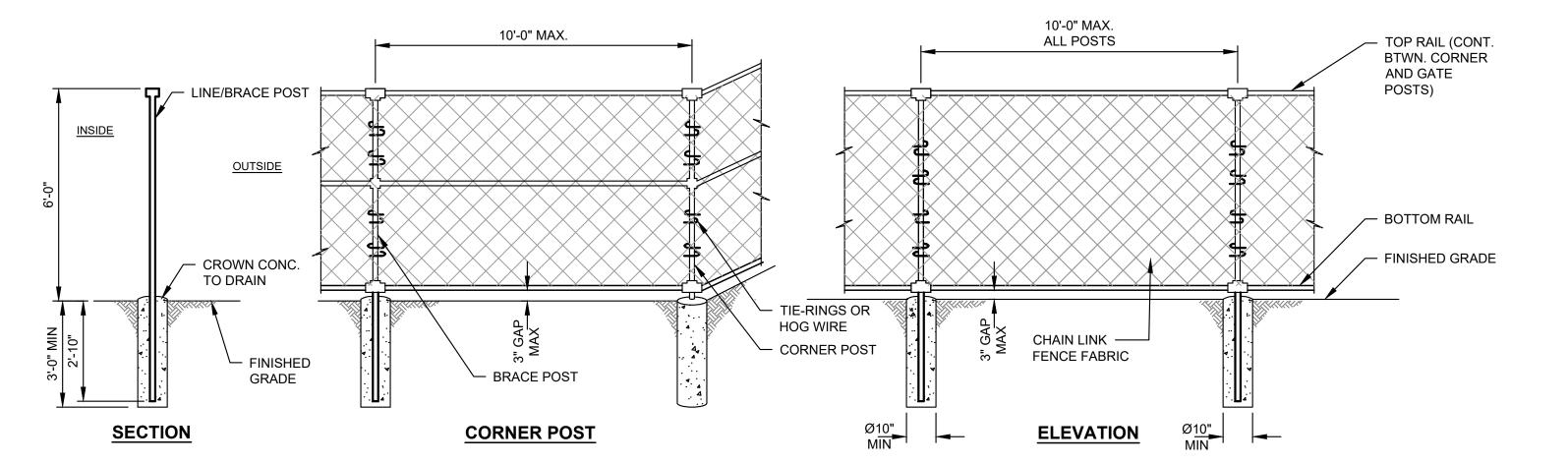
Page 25 of 25

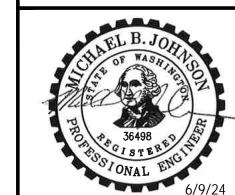
Gray & Osborne, Inc.

CONSULTING ENGINEERS

2102 CARRIAGE DRIVE SW,
BUILDING I
OLYMPIA, WA 98502

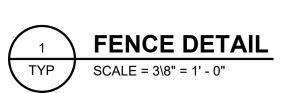
(360) 292-7481

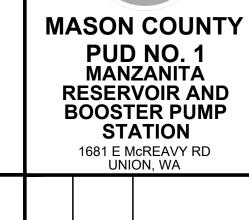


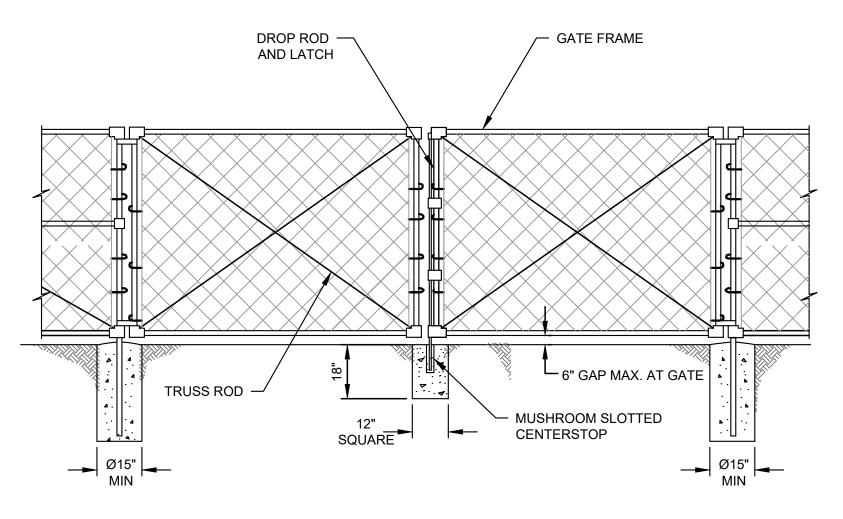


OTES:

- 1. SEE SPECIFICATIONS FOR TYPICAL MATERIAL AND INSTALLATION REQUIREMENTS.
- 2. INSTALL CORNER POSTS WHERE ALIGNMENT CHANGES 30° OR MORE.
- 3. PROVIDE GALVANIZED FINISH ON POSTS, RAILS AND FITTINGS.







NOTES:

- 1. SEE SPECIFICATIONS FOR TYPICAL MATERIAL AND INSTALLATION REQUIREMENTS.
- 2. INSTALL CORNER POSTS WHERE ALIGNMENT CHANGES 30° OR MORE.
- 3. PROVIDE GALVANIZED FINISH ON POSTS, RAILS AND FITTINGS.
- 4. PROVIDE GALVANIZED IRON, MUSHROOM TYPE, SLOTTED CENTERSTOP FOR DOUBLE GATE DROP ROD. EMBED IN 12"X12"X18" DIA. CONC. FOUNDATION.
- 5. DROP ROD FOR SWING SHALL COME EQUIPPED WITH PADLOCK LATCH.

2 DOUBLE SWING GATE DETAIL

TYP SCALE = 3\8" = 1' - 0"

No. DATE REVISION

ISSUED FOR:

PERMIT SET

ISSUE DATE: JUNE 2024

APPROVED BY: MBJ

CHECKED BY: SLG

DRAWN BY: JPW

DESIGNER: SLG

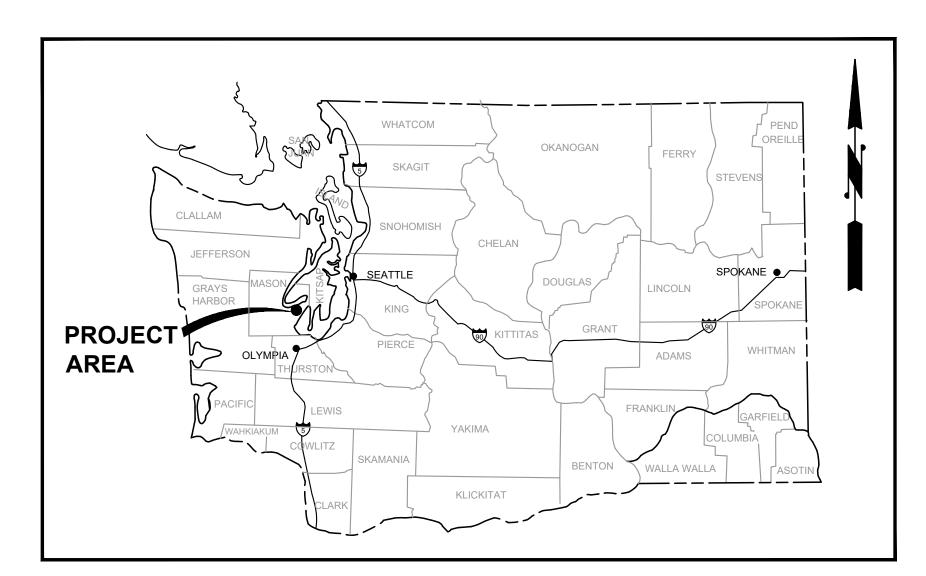
G & O JOB NO.: 22260.00

FILE: DETAILS.DWG

CIVIL DETAILS

FENCE AND GENERATOR PAD DETAILS

DRAWING: CD-7 OF: 7



SITE **COPY**

Plans to be kept on site These plans must be on the job site for inspection

MODIFICATION STORMWATER

VICINITY MAP

REVIEW ONLY ON THIS PLAN SET

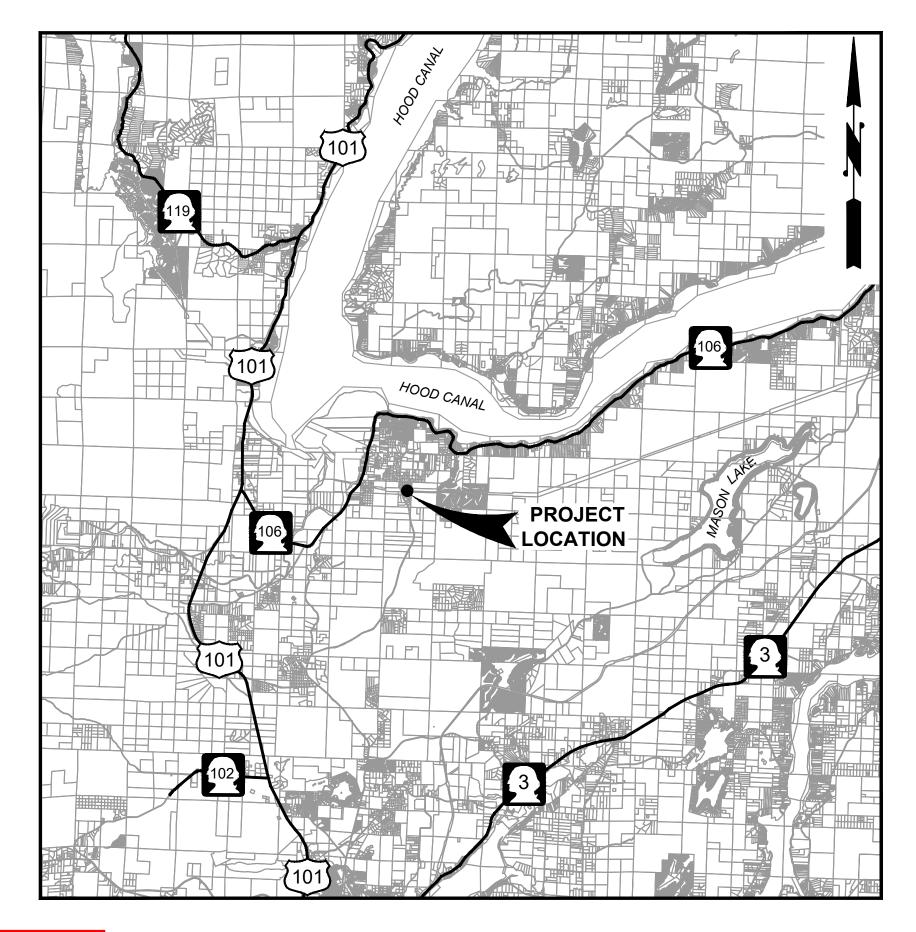
AND

AREA NUMBER

HIGHLAND PARK

MANZANITA RESERVOIRS

MANZANITA BOOSTER PUMP STATION BUILDING



MUST COMPLY WITH PERMIT CONDITIONS

LOCATION MAP SCALE: 1" = 10,000'

m		
	SHEET INDEX	
SHEET NO	DESCRIPTION	
	COVER SHEET	
GENERAL		
	SHEET INDEX, VICINITY AND LOCATION MAPS	
G -2	ABBREVIATIONS, LINETYPES, SYMBOLS, AND GENERAL NOTES	
G-3	PROCESS FLOW DIAGRAM	
G-4	SURVEY CONTROL - MTN 2 COAST LLC	
G-5	SURVEY CONTROL - MTN 2 COAST LLC	
G-6	OVERALL EXISTING PROJECT MAP	
CIVIL		
C1-1	HIGHLAND PARK EXISTING SITE AND DEMOLITION SITE PLAN	
€ 1-2	HIGHLAND PARK SALVAGE AND DEMOLITION PLAN	
C1-3	HIGHLAND PARK PIPING PLAN	
C 2-1	MANZANITA EXISTING SITE AND DEMOLITION PLAN	
C2-2	PROPOSED OVERALL PLAN	
C2-3	RESERVOIR AND BOOSTER STATION PIPING PLAN	
C2-4	PROPOSED WATER MAIN PLAN	
C2-5	PROPOSED STORMWATER POND GRADING AND PIPING PLAN	
€ 2-6	PROPOSED STORMWATER POND GRADING AND PIPING SECTIONS	
C2-7	RESERVOIR AND BOOSTER STATION GRADING PLAN	
C2-8	RESERVOIR AND BOOSTER PUMP PROPOSED GRADING SECTIONS	
CD-1	TESC NOTES	
€D-2	TESC DETAILS	
CD-3	TRENCH AND RESTORATION DETAILS	
CD-4	WATER DETAILS	
CD-5	DRAINAGE AND MISCELLANEOUS DETAILS	
€D-6	STORMWATER DETAILS	
CD-7	FENCE AND GENERATOR PAD DETAILS	
MECHANICAL		
M-1	PIPE SYMBOLS, GENERAL SYMBOLS, AREA AND EQUIPEMENT IDENTIFICATIONS	
M-2	DETAILS	
M2-1	RESERVOIR 1 AND 2 FLOOR PLAN	
M2-2	RESERVOIR ROOF PLAN, ELEVATION AND DETAIL	
M2-3	RESERVOIR DETAILS	
M2-4	RESERVOIR DETAILS	
M2-5	RESERVOIR DETAILS	
M2-6	RESERVOIR DETAILS	
M3-1	BOOSTER PUMP STATION BUILDING PLAN	

SHEET INDEX		
SHEET NO	DESCRIPTION	
STRUCTURAL		
S-1	GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS	
S-2	TYPICAL STRUCTURAL DETAILS	
S-3	TYPICAL STRUCTURAL DETAILS	
S3-1	BOOSTER STATION FOUNDATION, FLOOR AND ROOF FRAMING PLAN	
S3-2	BOOSTER STATION ELEVATIONS AND CROSS SECTION	
S3-3	STRUCTURAL SECTIONS	
HVAC		
H2-1	HVAC DESIGN CRITERIA, ABBREV SYMBOLS, EQUIP DENT & NOTES	
H2-2	HVAC FLOOR PLAN	
ELECTRICAL		
E-1	ELECTRICAL SYMBOLS ABBREVIATIONS AND GENERAL NOTES	
E-2	DEVICE TAG LIST, WORK SUMMARY	
E-3	MODIFIED ELECTRICAL SINE PLAN	
E-4	MODIFIED ELECTRICAL SITE RLAN	
E-5	RESERVOIR 1 AND 2 ELECTRICAL PLAN	
E-6	ONE-LINE DIAGRAM	
E-7	GROUNDING ONE-LINE DIAGRAM	
E-8	POWER CONTROL AND INSTRUMENTA NON PLAN	
E-9	LIGHTING AND RECEPTACLE PLAN	
E-10	HVAC FIRE AND SECURITY	
E-11	SITE CONTROL PANEL [03 CP 01] ELEVATIONS	
E-12	CONTROL PANEL [03 CP 01] ELEMENTARY WIRING DIAGRAM	
E-13	CONTROL PANEL [03 CP 01] ELEMENTARY WIRING DIAGRAM (CONT.)	
E-14	[03 PB 01] 80V 3 PHASE PANELBOARD	
E-15	[03 PB 02] 240V 1 PHASE PANELBOARD	
E-16	AUTODIALER I-O AND ALARMING	
E-17	PLC EXTENDED I-O	
E-18	CABLE AND CONDUIT SCHEDULE	
ED-1	INDOOR TO UNDERGROUND TRANSITIONS	
ED-2	CONCRETE RESERVOIR ELECTRICAL DETAILS	
ED-3	INTRUSION SWITCH DETAILS	
ED-	SITEWORK DETAILS	
5 0-5	MISCELLANEOUS DETAILS	

STORMWATER REIVEWED BY PETER BAURISTA-**PUBLIC WORKS DECEMBER 16, 2024**

Reviewed for Code Compliance Mason County Building **Department**

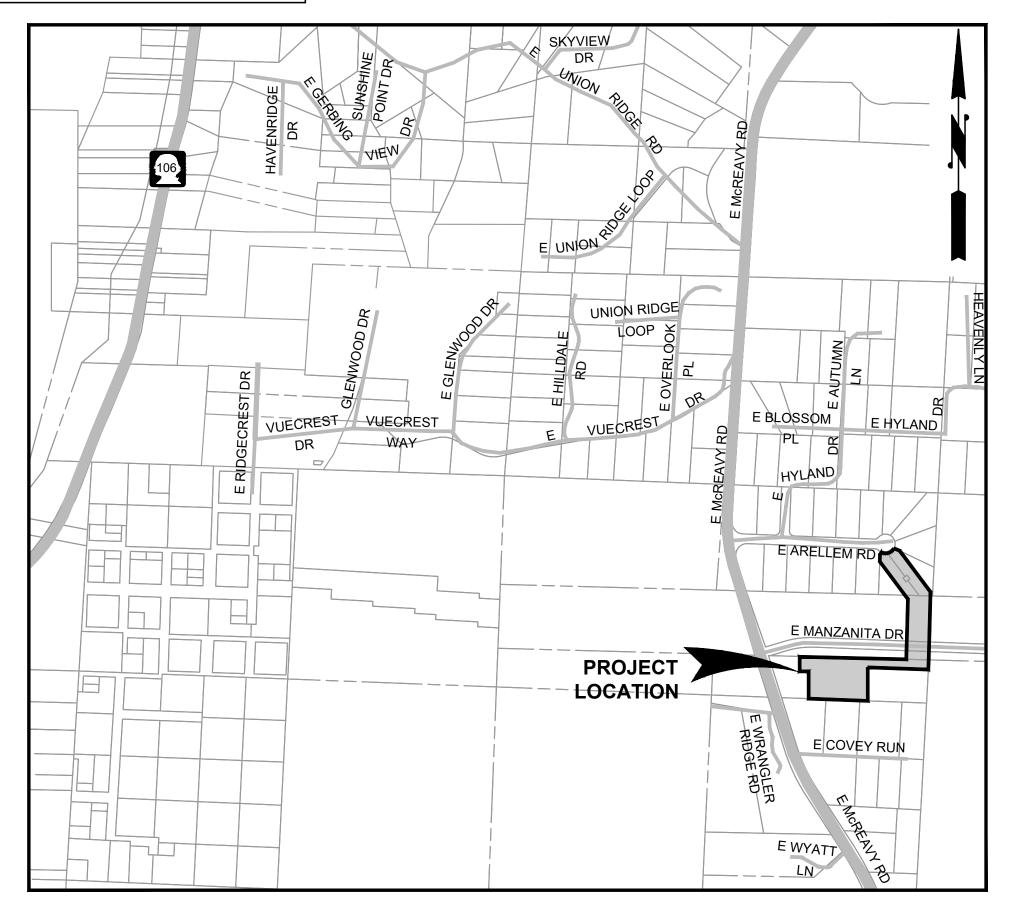
> SEE GEOLOGICAL REPORT **GEOLOGICAL**

 \sim

ENGINEERING SERICE REPORT DATED: JUNE 7, 2022

MUST MEET OR EXCEED ALL REQUIREMENT PER **GEOLOGICAL REPORT**

Reviewed for Code Compliance **Mason County Building Department**



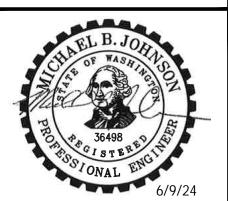
MUST MEET ALL CURRENT WASHINGTON STATE CODES

AREA MAP SCALE: 1" = 600'

Engineering and Architectural Drawings
Construction must match all designs and apecifications of the proval must be provided from the design professional responsible for the work that has been altered. ***NOTE: Structural engineering shall supersede Mason County "Typical" notes for structural items.***

Gray & Osborne, Inc. 2102 CARRIAGE DRIVE SW, **BUILDING I** OLYMPIA, WA 98502

(360) 292-7481



MASON COUNTY PUD NO. 1 MANZANITA RESERVOIR AND **BOOSTER PUMP** STATION 1681 E McREAVY RD UNION, WA

No. DATE REVISION ISSUED FOR: PERMIT SET ISSUE DATE: JUNE 2024

DRAWN BY: DESIGNER: SLG G & O JOB NO.: 22260.00 VIC_MAP.DWG

SLG

APPROVED BY:

CHECKED BY:

TWO INCHES AT FULL SCALE.
IF NOT, SCALE ACCORDINGLY

GENERAL

SHEET INDEX, VICINITY AND LOCATION MAPS

DRAWING: G-1 OF: 6

LINETYPES ABBREVIATIONS EXISTING PROPOSED **DESCRIPTION** ASBESTOS CEMENT PIPE ADJUST ALTERNATE SURFACE FEATURES ALUMINUM ALUM AMERICAN NATIONAL STANDARDS INSTITUTE ANSI ASPHALT PAVEMENT ANGLE POINT **ASPH** ASPHALT GRAVEL SURFACING ASSY **ASSEMBLY ASTM** AMERICAN SOCIETY OF TESTING AND MATERIALS **AVENUE** FENCE/RAILING (TYPE AS NOTED) AVE **BLIND FLANGE** BLDG BUILDING **FENCE WITH GATE** BLOCK BLK **BLOW OFF** ВО SHRUB/TREE/VEGETATION LINE BOP **BEGINNING OF PROJECT** BVCE BEGIN VERTICAL CURVE ELEVATION **EDGE OF LANDSCAPING BVCS** BEGIN VERTICAL CURVE STATION CONDUIT SILT FENCE CORRUGATED ALUMINUM PIPE CATCH BASIN — — — CLEARING LIMITS CUBIC FEET CFS CUBIC FEET PER SECOND **SURVEY** CICL CAST IRON CLASS CLR CLEARANCE CORRUGATED METAL PIPE CMP **RIGHT-OF-WAY LINE** CO CLEANOUT CONC CONCRETE **CENTERLINE OF RIGHT-OF-WAY** CONN CONNECTION CONT CONTINUED/CONTINUOUS PROPERTY LINE CPEP CORRUGATED POLYETHYLENE PIPE CPLG COUPLING PERMANENT EASEMENT LINE CTR CENTER CUBIC YARD CENTER LINE DRAIN DEGREE OF CURVATURE DC **DUCTILE IRON** <u>UTILITIES</u> DIA DIAMETER DIM DIMENSION — E — — E — — BURIED ELECTRICAL DOT DEPARTMENT OF TRANSPORTATION DWGS DRAWING(S) **OVERHEAD POWER** EAST —— OP —— OP —— EACH **ELEVATION POWER** ELEC **ELECTRICAL** EOA **EDGE OF ASPHALT** BURIED TELEPHONE/COMMUNICATIONS EOP **END OF PROJECT** EVCE END VERTICAL CURVE ELEVATION WATER MAIN (SIZE AS NOTED) **EVCS** END VERTICAL CURVE STATION **EXIST EXISTING** LIQUID PROPANE (SIZE AS NOTED) FIG **FIGURE** FIN **FINISHED** STORM DRAIN (SIZE AS NOTED) **FLANGE** FEET CULVERT (SIZE & TYPE AS NOTED) GAUGE GALV GALVANIZED —····—···—···— DITCH CENTERLINE/THALWEG GALVANIZED IRON GATE VALVE HDPE HIGH DENSITY POLYETHYLENE PIPE INSIDE DIAMETER INVERT ELEVATION

SEE GEOLOGICAL REPORT GEOLOGICAL ENGINEERING SERICE REPORT DATED: JUNE 7, 2022 MUST MEET OR EXCEED ALL REQUIREMENT PER GEOLOGICAL REPORT turumund

Reviewed for Code Compliance Mason County Building Department

WATER SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
	3	CAP/PLUG
#	Ħ	COUPLING/ADAPTER
\triangleright	•	REDUCER
\triangleleft	◄	THRUST BLOCK
\boxplus		WATER METER
	±	DRAFT HYDRANT
	•	SAMPLE STATION
	<u>JOINTS</u>	
	I	FLANGE/BLIND FLANGE
	С	MECHANICAL JOINT
	<u>VALVES</u>	
P°		AIR RELIEF VALVE
Ŷ		BLOW-OFF VALVE
\bowtie	H	GATE VALVE
	ā	INLINE CHECK VALVE

POWER/TELEPHONE SYMBOLS

FLEXIBLE EXPANSION JOINT

EXISTING	PROPOSED	DESCRIPTION
-0-		UTILITY POLE
\leftarrow		UTILITY POLE ANCHOR
\bowtie		UTILITY PEDESTAL

SURVEY SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
⊠		HUB AND TACK
•		REBAR AND CONTROL CAP

SANITARY/STORM SEWER SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
0	0	STORM DRAIN MANHOLE/TYPE 2 CATCH BASIN (ACTUAL DIMENSION SHOWN FOF PROPOSED)
		STORM DRAIN CATCH BASIN, CONCRETI INLET, OR YARD/AREA DRAIN (ACTUAL DIMENSION SHOWN FOR PROPOSED)
0		CLEAN OUT

SURFACE FEATURES/LANDSCAPING

<u>EXISTING</u>	PROPOSED	DESCRIPTION
		BUILDING
		MAIL BOX (NOTED)
Д		SIGN
M		TREE STUMP
		TREE (CONIFER)
\odot		TREE (DECIDUOUS)

GENERAL NOTES:

- ALL MATERIALS AND WORKMANSHIP SHALL BE FURNISHED AND SUPPLIED IN ACCORDANCE WITH THE 2022 EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, UNLESS OTHERWISE SPECIFICALLY NOTED.
- 2. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT AND COORDINATE WITH ALL UTILITY COMPANIES IN ORDER TO ASSURE THAT ALL LINES, PIPES, POLES AND OTHER APPURTENANCES ARE PROPERLY LOCATED, SECURED, AND/OR PROTECTED. BURIED UTILITIES (WHERE KNOWN) ARE SHOWN IN THEIR APPROXIMATE LOCATION. THE CONTRACTOR SHALL HAVE UTILITIES VERIFIED ON THE GROUND PRIOR TO ANY CONSTRUCTION. NOTIFY THE UNDERGROUND UTILITIES LOCATE CENTER: 1-800-424-5555.
- 3. ON-SITE EROSION AND SEDIMENT CONTROL MEASURES ARE REQUIRED AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- 4. THE CONTRACTOR SHALL HAVE A COPY OF THESE PLANS, ANY ADDENDA, CHANGE ORDERS, AND THE CONTRACT SPECIFICATIONS ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
- 5. THE CONTRACTOR SHALL MAINTAIN A CLEAN LEGIBLE SET OF RECORD DRAWINGS AND PROVIDE A SET TO THE OWNER PRIOR TO DEMOBILIZATION OF THE SITE. SEE SPECIFICATIONS.

Gray & Osborne, Inc CONSULTING ENGINEERS

2102 CARRIAGE DRIVE SW,

BUILDING I

OLYMPIA, WA 98502

(360) 292-7481



MASON COUNTY PUD NO. MANZANITA **RESERVOIR AND BOOSTER PUMP** STATION 1681 E McREAVY RD

UNION, WA

No. DATE REVISION ISSUED FOR: PERMIT SET ISSUE DATE: JUNE 2024 APPROVED BY: CHECKED BY: SLG DRAWN BY: JPW DESIGNER: SLG

22260.00

LEGEND.DWG TWO INCHES AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

G & O JOB NO.:

GENERAL

ABBREVIATIONS, LINETYPES, SYMBOLS, AND GENERAL NOTES

DRAWING: **G-2** OF: **6**

Engineering and Architectural Drawings Construction must match all designs and apecifications of the nitectural and or the Engineering requirements OR a stamped letter o pproval must be provided from the design professional responsible for the work that has been altered. ***NOTE: Structural engineering shall supersede Mason County "Typical" notes for structural items.**

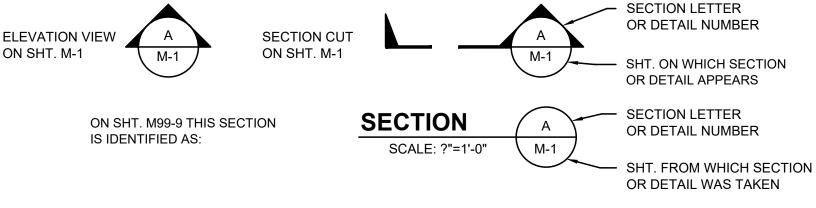
DETAILS ARE REFERENCED IN

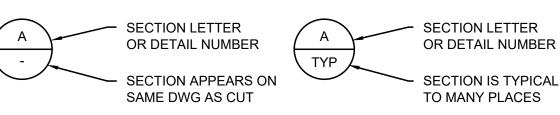
ARE USED INSTEAD OF LETTERS

A SIMILAR MANNER EXCEPT NUMBERS

EXAMPLE OF SECTION NUMBERING SYSTEM AND PLAN/DRAWING TITLES

FOR DETAILS SUBSTITUTE DETAIL NUMBER FOR SECTION LETTER





DRAWING TITLE IDENTIFICATION:

DRAWING TITLE SCALE: ?"=1'-0"

MUST MEET ALL CURRENT WASHINGTON STATE CODES

PT PVC

PVT QTY R/W REQD

SPECS STA STD TEL TESC THRD

THREADED THRU **THROUGH** TYP TYPICAL

VERT VERTICAL WEST WITH

WITHOUT W/O

INVERT

LENGTH

POUND

MFR

MIN

MISC

NO

NTS

OD

PERF

PVMT

RED

REINF

RET

SCH

SHT

LINEAR FEET MAXIMUM

MANHOLE

MINIMUM

NORTH

NUMBER

MANUFACTURER

MISCELLANEOUS MECHANICAL JOINT

NOT TO SCALE

OUTSIDE DIAMETER

POINT OF CURVATURE

POINT OF INTERSECTION

POINT OF TANGENCY

POLYVINYL CHLORIDE

POINT OF VERTICAL INTERSECTION

POINT OF VERTICAL TANGENT

ON CENTER

PLAIN END

PERFORATED

POWER POLE

PAVEMENT

QUANTITY

REDUCER

REINFORCE

REQUIRED

RETAINING RAILROAD

SCHEDULE

SQUARE FEET

SPECIFICATIONS

SOUTH

SHEET

SLOPE

SQUARE STATION

STANDARD THRUST BLOCK TOP OF CURB

TELEPHONE

RIGHT-OF-WAY

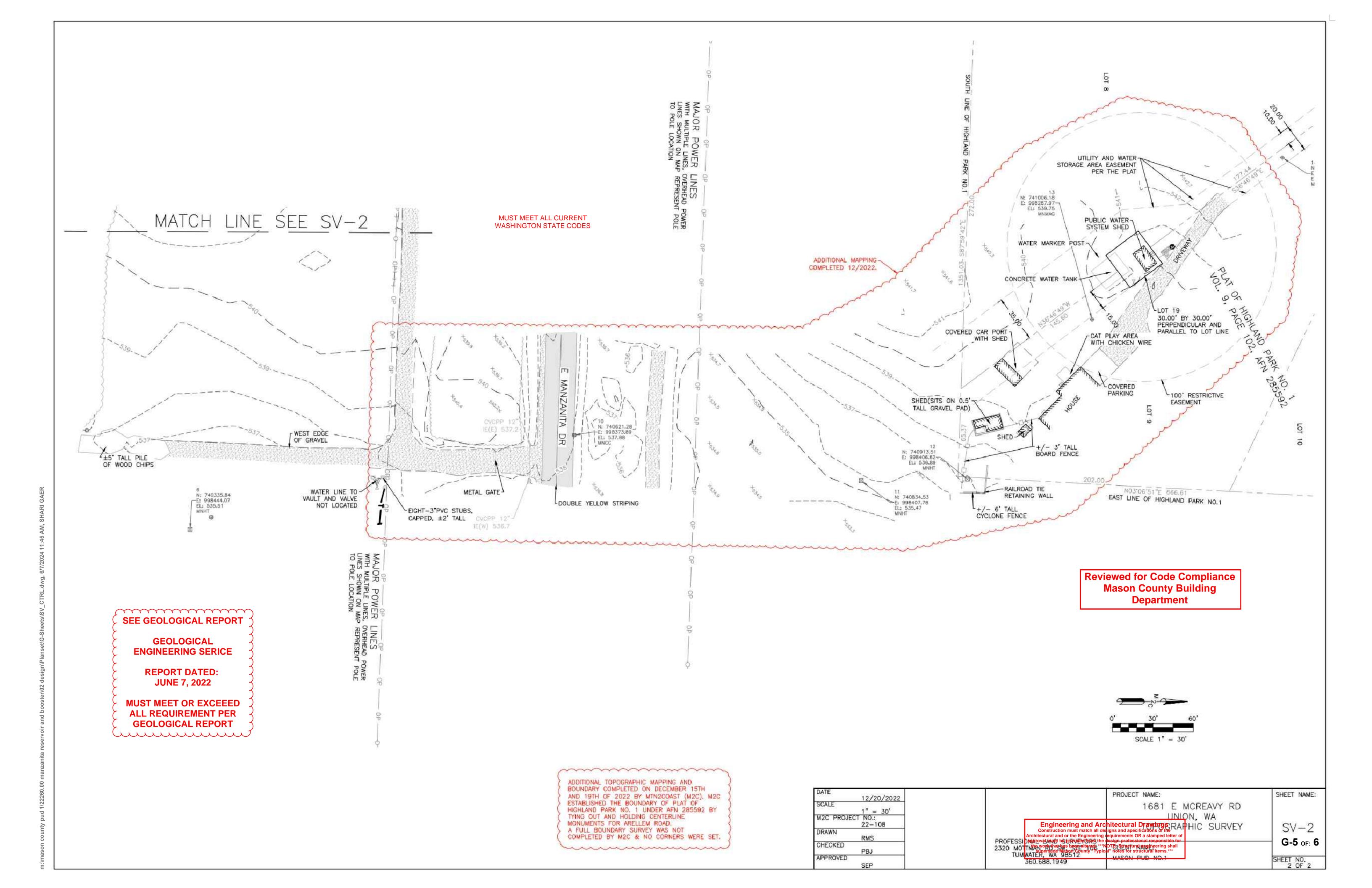
RADIUS

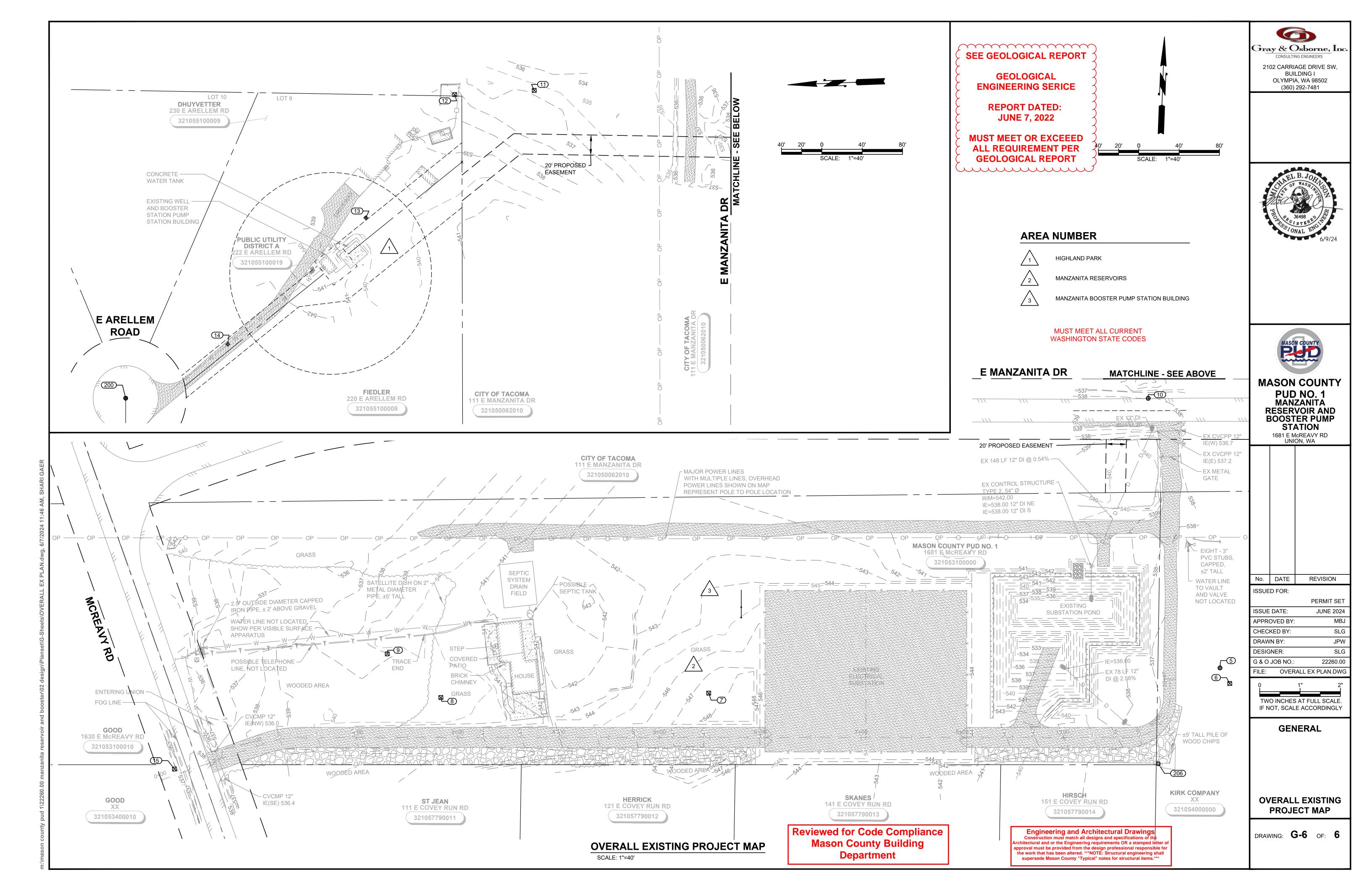
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

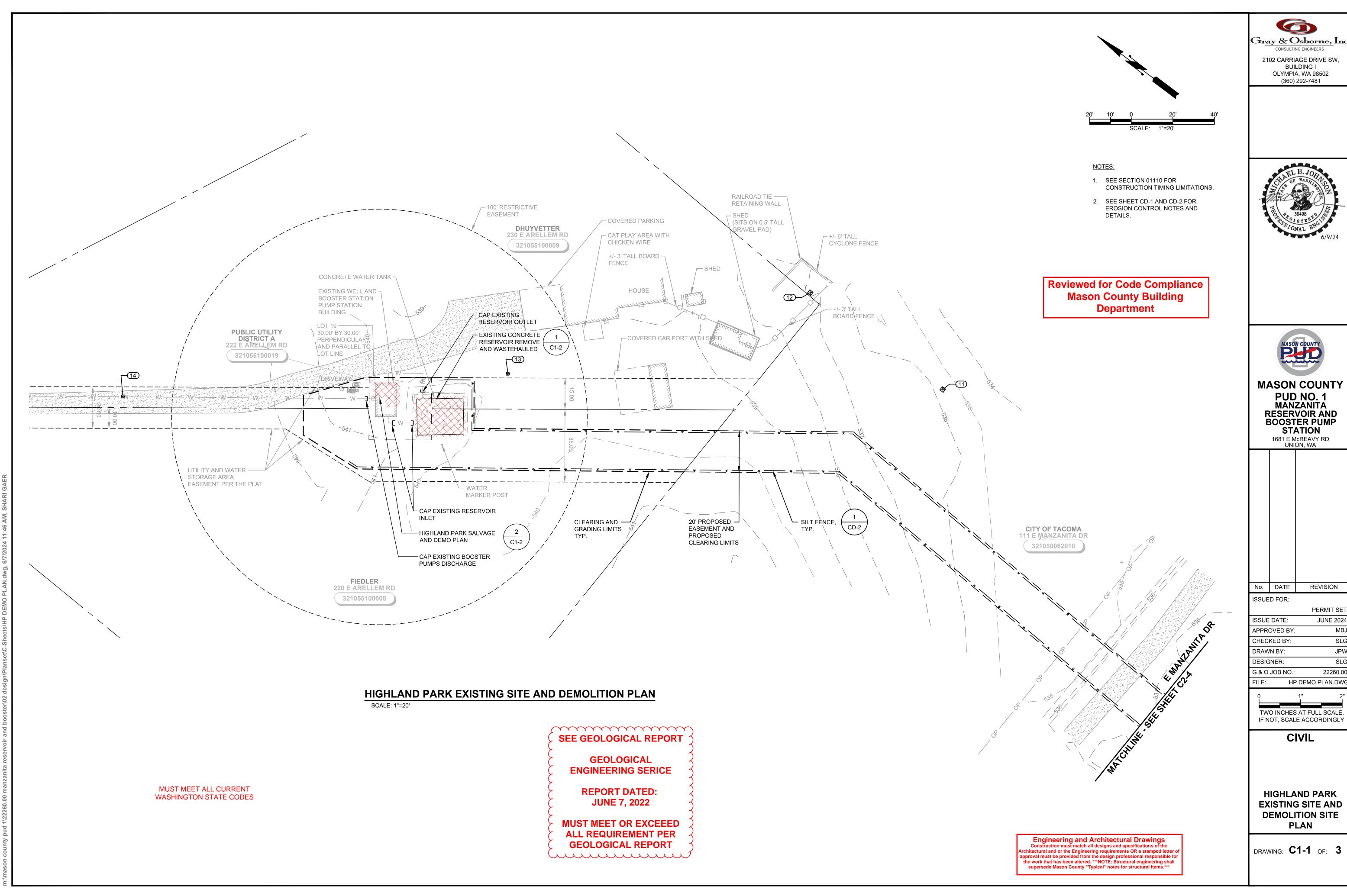
TEMPORARY EROSION AND SEDIMENT CONTROL

SHEET NO. 1 OF 1

360.688.1949



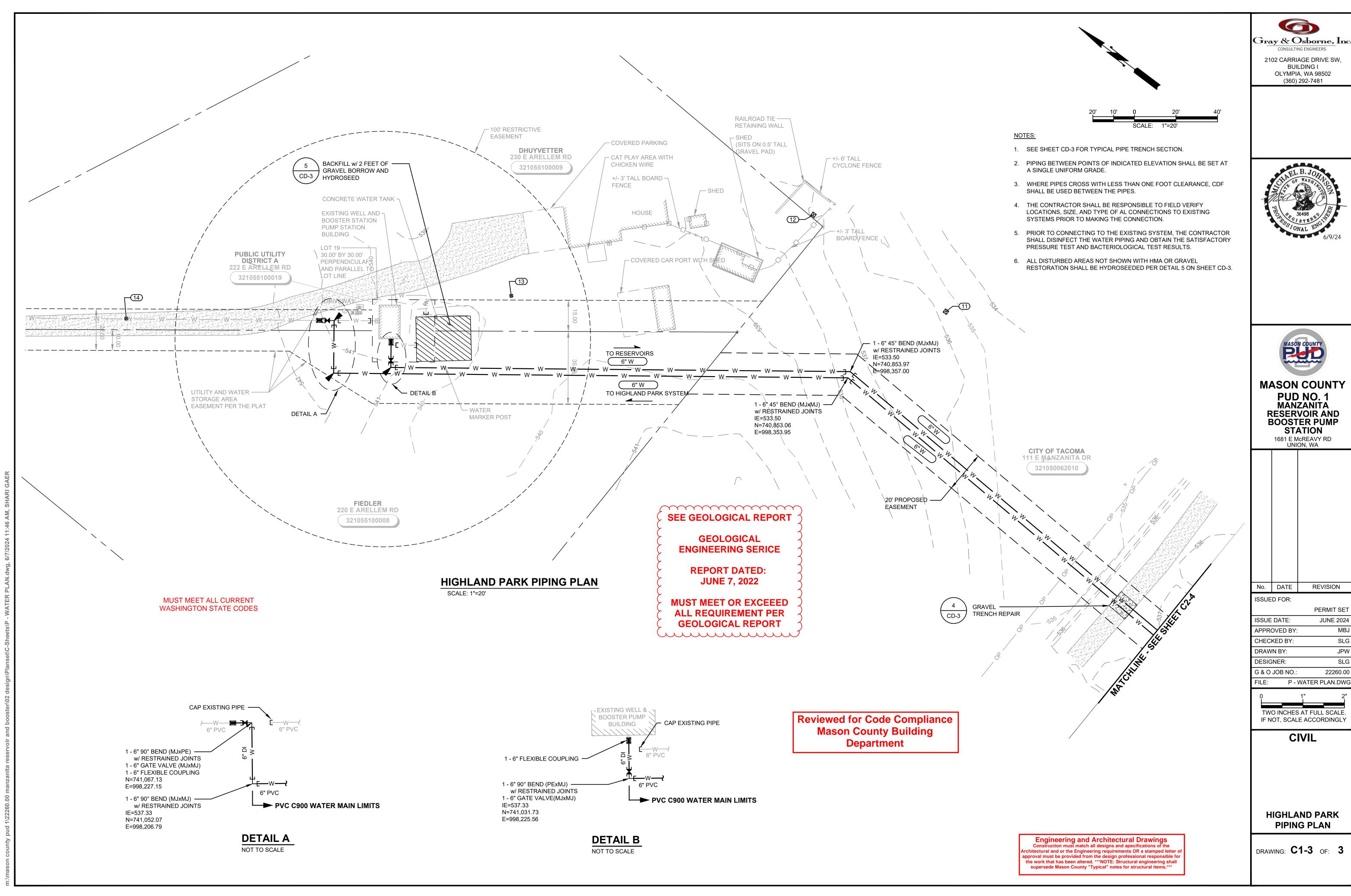




Gray & Osborne, Inc.

PERMIT SET JUNE 2024 SLG

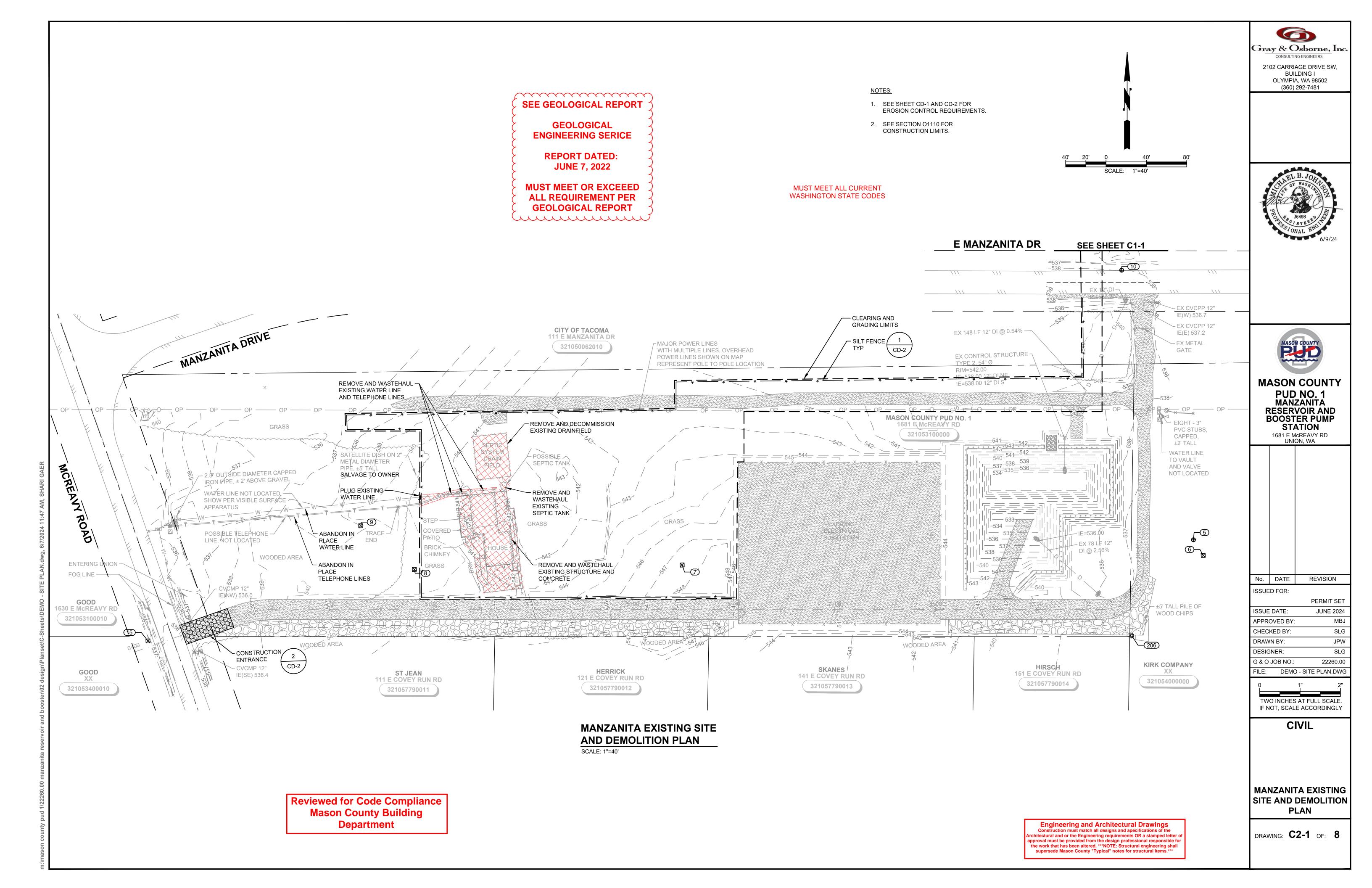
JPW SLG 22260.00 HP DEMO PLAN.DWG

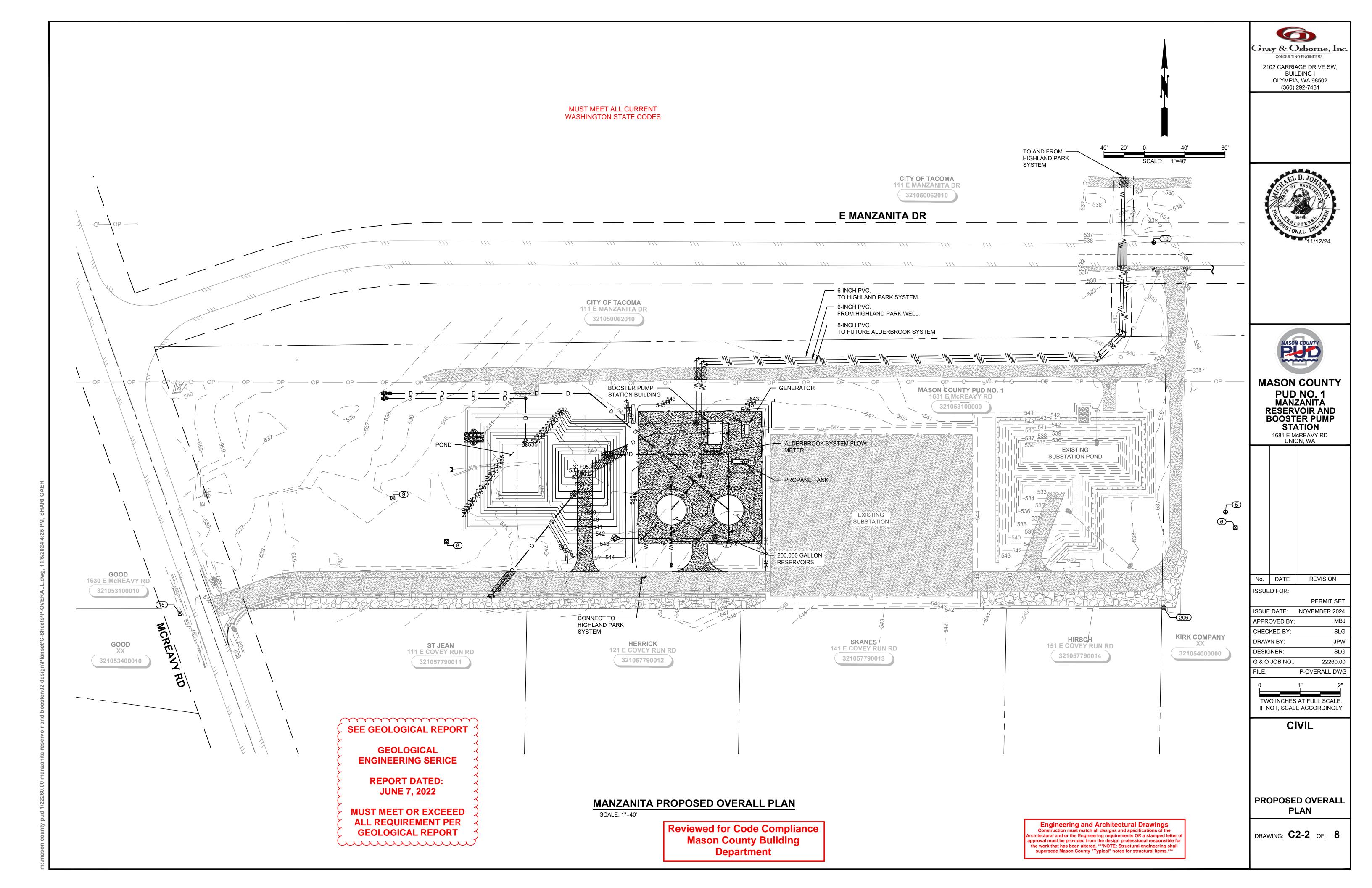


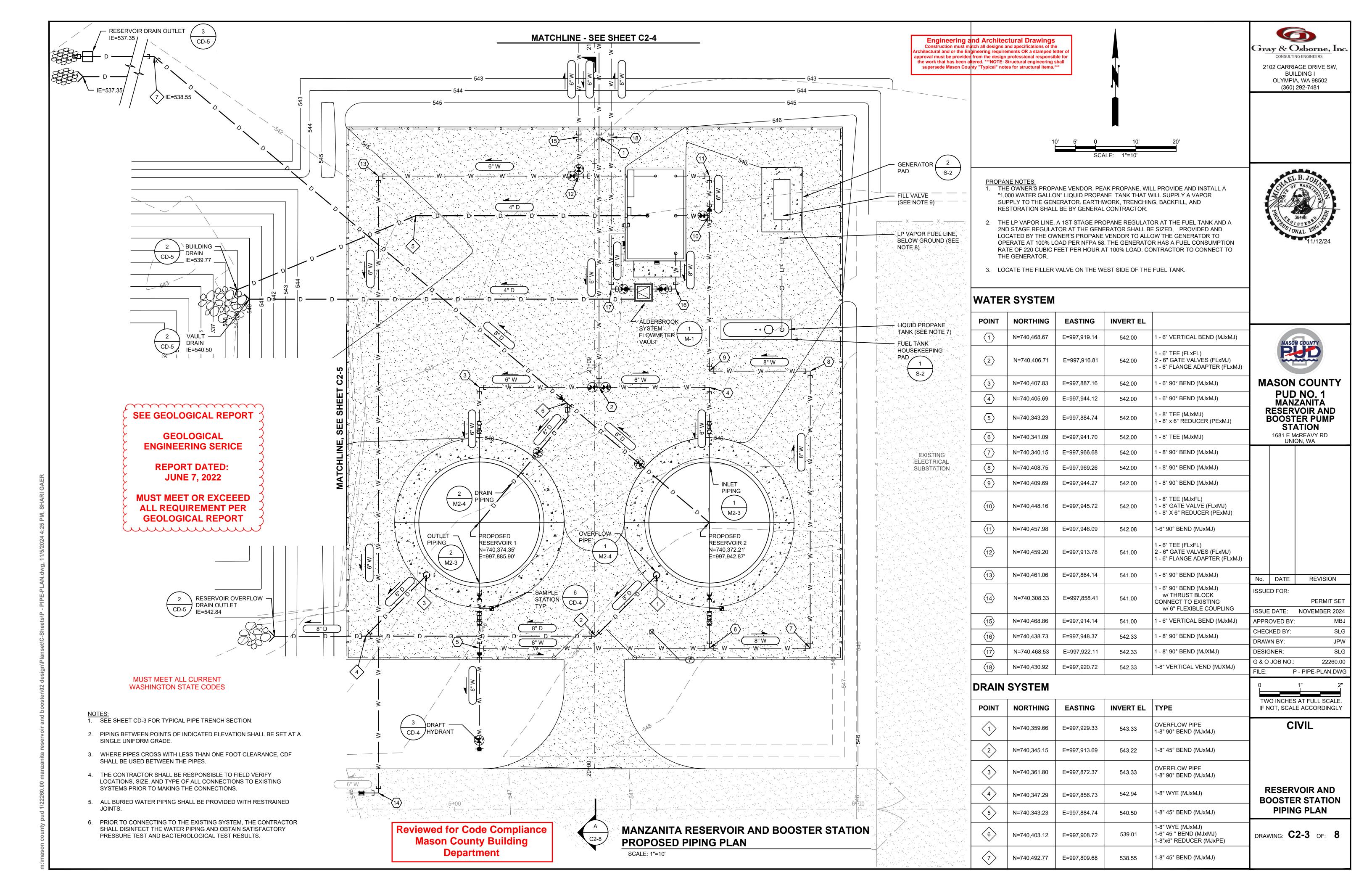
Gray & Osborne, Inc.

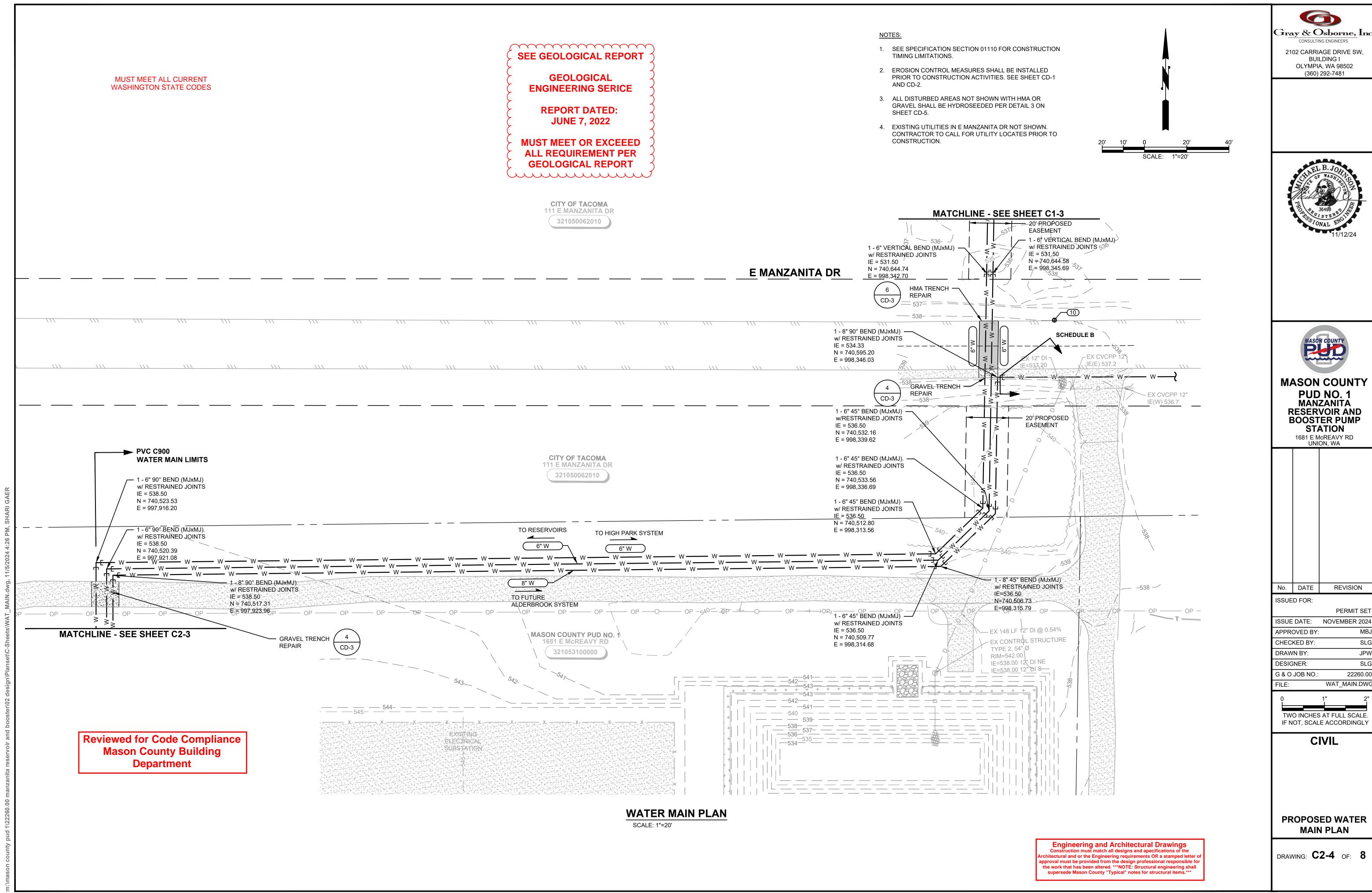
REVISION

SLG JPW SLG 22260.00







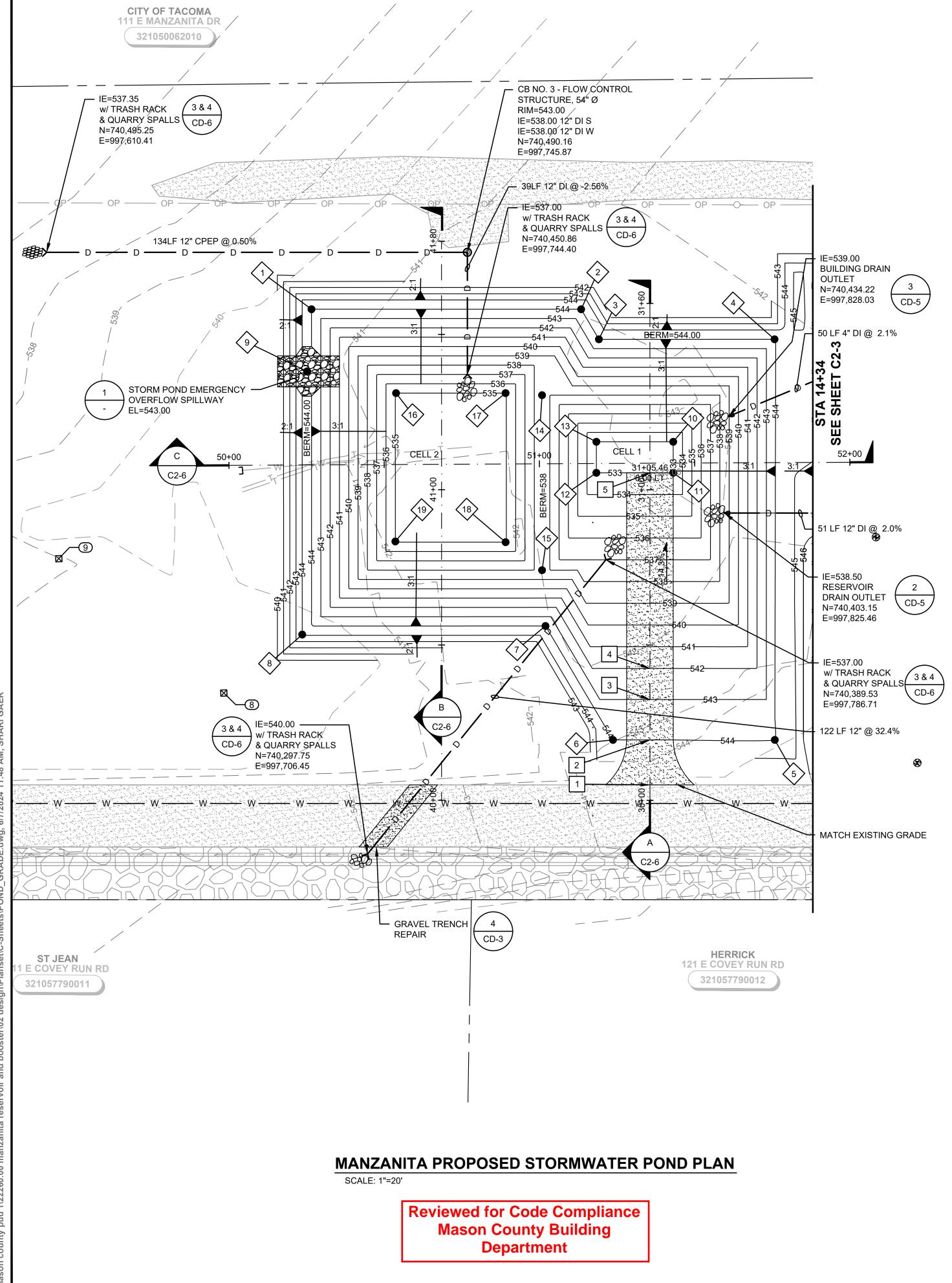


Gray & Osborne, Inc. 2102 CARRIAGE DRIVE SW,

REVISION

ISSUE DATE: NOVEMBER 2024 SLG JPW SLG 22260.00

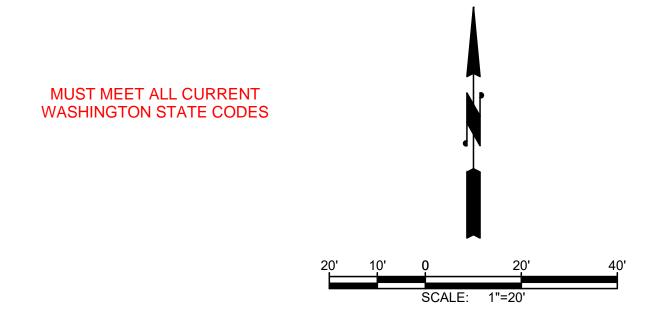




STORMWATER POND INFORMAT	TON
FACILITY TYPE	DETENTION / WETPOND
BOTTOM ELEVATION (CELL 1)	533.00
BOTTOM ELEVATION (CELL 2)	535.00
SEDIMENT STORAGE ELEVATION (CELL 1)	534.00
REQUIRED DEAD STORAGE VOLUME (WATER QUALITY)	0.309 AC-FT
DESIGN DEAD STORAGE AREA (WATER QUALITY)	0.398 AC-FT
WATER QUALITY SURFACE ELEVATION	538 FT
BERM ELEVATION	544.00
EMERGENCY OVERFLOW WATER SURFACE ELEVATION	543.00'
REQUIRED LIVE STORAGE VOLUME (DETENTION)	0.614 AC-FT
DESIGN LIVE STORAGE AREA (DETENTION)	0.910 AC-FT
TOP OF LIVE STORAGE SURFACE	542.00

STORMWATER POND ACCESS ROAD INFORMATION							
POINT #	ITEM	NORTHING 8	& EASTING	ELEVATION			
1	BEGIN ACCESS RD	N=740,316.59	E=997,798.21	544.73*			
2	GRADE BREAK	N=740,331.05	E=997,798.74	544.00			
3	GRADE BREAK	N=740,344.04	E=997,799.23	543.00			
4	GRADE BREAK	N=740,354.04	E=997,799.60	542.00			
5	BOTTOM CELL 1	N=740,416.98	E=997,802.15	533.00			
	* MATCH EXISTING ELEVATION						

STC	STORMWATER POND GRADING INFORMATION				
POINT #	ITEM	NORTHING AND EASTING			
1	POND TOP	N=740,473.73 E=997,695.00			
2	POND TOP	N=740,470.45 E=997,781.80			
3	POND TOP	N=740,460.58 E=997,787.15			
4	POND TOP	N=740,458.44 E=997,844.06			
5	POND TOP	N=740,329.55 E=997,838.93			
6	POND TOP	N=740,331.50 E=997,786.83			
7	POND TOP	N=740,368.98 E=997,766.24			
8	POND TOP	N=740,368.91 E=997,688.07			
9	EMERGENCY OVERFLOW SPILLWAY	N=740,453.79 E=997,692.82			
10	CELL 1 BOTTOM	N=740,426.70 E=997,809.83			
11	CELL 1 BOTTOM	N=740,416.71 E=997,809.46			
12	CELL 1 BOTTOM	N=740,417.64 E=997,784.72			
13	CELL 1 BOTTOM	N=740,427.63 E=997,785.10			
14	WETPOND BERM	N=740,443.28 E=997,768.18			
15	WETPOND BERN	N=740,386.97 E=997,766.06			
16	CELL 2 BOTTOM	N=740,445.72 E=997,721.20			
17>	CELL 2 BOTTOM	N=740,444.39 E=997,756.46			
18	CELL 2 BOTTOM	N=740,396.42 E=997,754.67			
19	CELL 2 BOTTOM	N=740,397.75 E=997,719.41			
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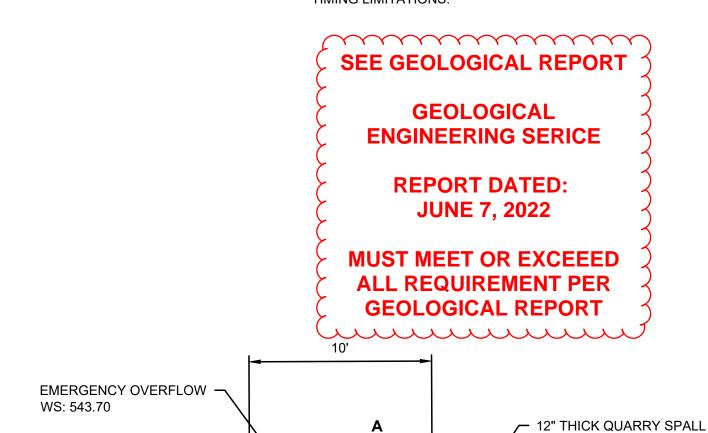


- 1. NUMERICAL CALL-OUTS REFER TO FINISHED GRADE ELEVATIONS UNLESS OTHERWISE NOTED.
- 2. SLOPE FINISHED GROUND AWAY FROM ALL STRUCTURES; SLOPE TO DRAIN AT 2% MIN SLOPE.
- 3. EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO CONSTRUCTION ACTIVITIES. SEE SHEET CD-1 AND C-2.
- 4. SEE DETAIL 8 ON CD-3 FOR PLANTING OF POND. ALL OTHER DISTURBED AREAS NOT SHOWN WITH GRAVEL RESTORATION SHALL BE HYDROSEEDED PER DETAIL 5 ON SHEET CD-3.
- 5. SEE SPECIFICATION SECTION 01110 FOR CONSTRUCTION TIMING LIMITATIONS.

DESIGN WS: 542.00

OUTLET ELEVATION: 543.00 ANTICIPATED OUTLET MAXIMUM

FLOW RATE 2.252 CFS

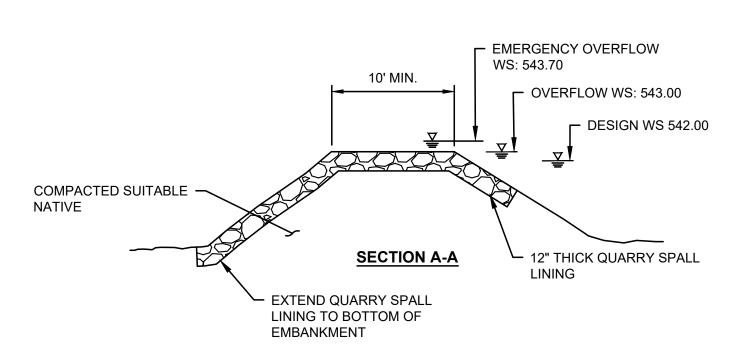


EMERGENCY OVERFLOW SPILLWAY

EL=544.00

FREEBOARD

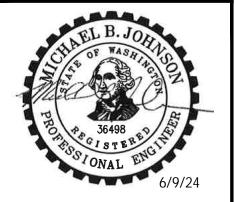
OVERFLOW¥





Engineering and Architectural Drawings
Construction must match all designs and apecifications of the itectural and or the Engineering requirements OR a stamped letter o proval must be provided from the design professional responsible for the work that has been altered. ***NOTE: Structural engineering shall supersede Mason County "Typical" notes for structural items. ***







MANZANITA **RESERVOIR AND BOOSTER PUMP** STATION 1681 E McREAVY RD UNION, WA

0.	DATE	REVISION
SIIE	D EOD:	

ISSUED FOR: PERMIT SET ISSUE DATE: JUNE 2024 APPROVED BY: SLG CHECKED BY: JPW DRAWN BY: SLG DESIGNER: G & O JOB NO.: 22260.00

POND_GRADE.DWG

TWO INCHES AT FULL SCALE IF NOT, SCALE ACCORDINGLY

CIVIL

PROPOSED STORMWATER POND **GRADING AND PIPING PLAN**

DRAWING: C2-5 OF: 8

550 550 TOP OF ACCESS ROAD EL=544.32 STA: 30+05.00, 0.00' RT DETENTION SURFACE ——— EL=542.00... BERM EL=544.00 WATER QUALITY SURFACE -EL=538.00 540 540 COMPACT GRAVEL — SUITABLE NATIVE : BORROW (DEPTH VARIES); TYP 535 535 CELL 1, 4" COMPACTED DEPTH — CRUSHED SURFACING TOP COURSE ACCESS ROAD. 530 530 ► BOT:TOM OF ACCESS ROAD EL=533.00 STA: 31+05.46, 0.00' RT EG CROSS SECTION 525 525 FG CROSS SECTION \(\frac{\pi}{\infty}\) 542 533 **520 520** 30+00 31+00 31+60

SEE GEOLOGICAL REPORT

GEOLOGICAL ENGINEERING SERICE

REPORT DATED: JUNE 7, 2022

MUST MEET OR EXCEED
ALL REQUIREMENT PER
GEOLOGICAL REPORT

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Gray & Osborne, Inc.

2102 CARRIAGE DRIVE SW, BUILDING I

OLYMPIA, WA 98502

(360) 292-7481

ASON COUNTY
ASON COUN

PUD NO. 1
MANZANITA
RESERVOIR AND
BOOSTER PUMP
STATION
1681 E MCREAVY RD

BOOSTER PUMP STATION 1681 E McREAVY RD UNION, WA

No. DATE REVISION

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APPROVED BY:

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SLG

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DESIGNER: SLG
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FILE: POND_GRADE.DWG

TWO INCHES AT FULL SCALE.
IF NOT, SCALE ACCORDINGLY

CIVIL

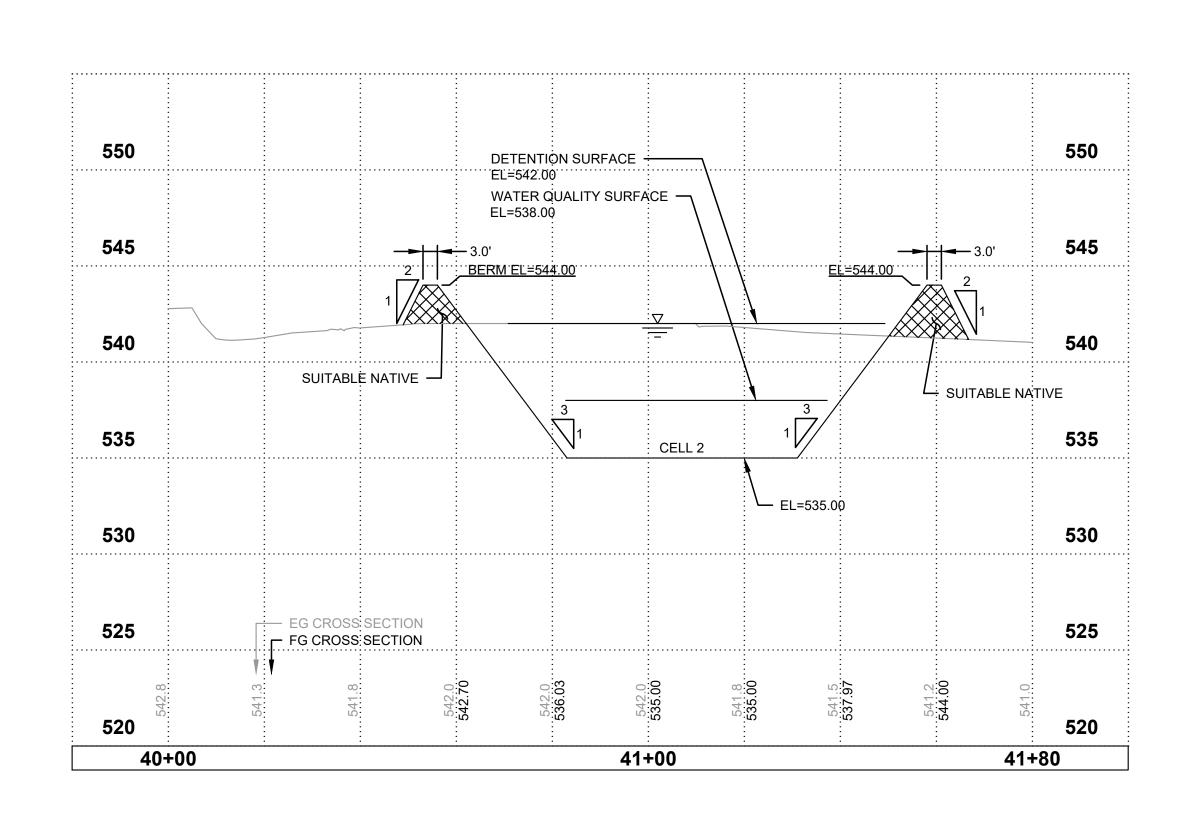
PROPOSED
STORMWATER POND
GRADING AND PIPING
SECTIONS

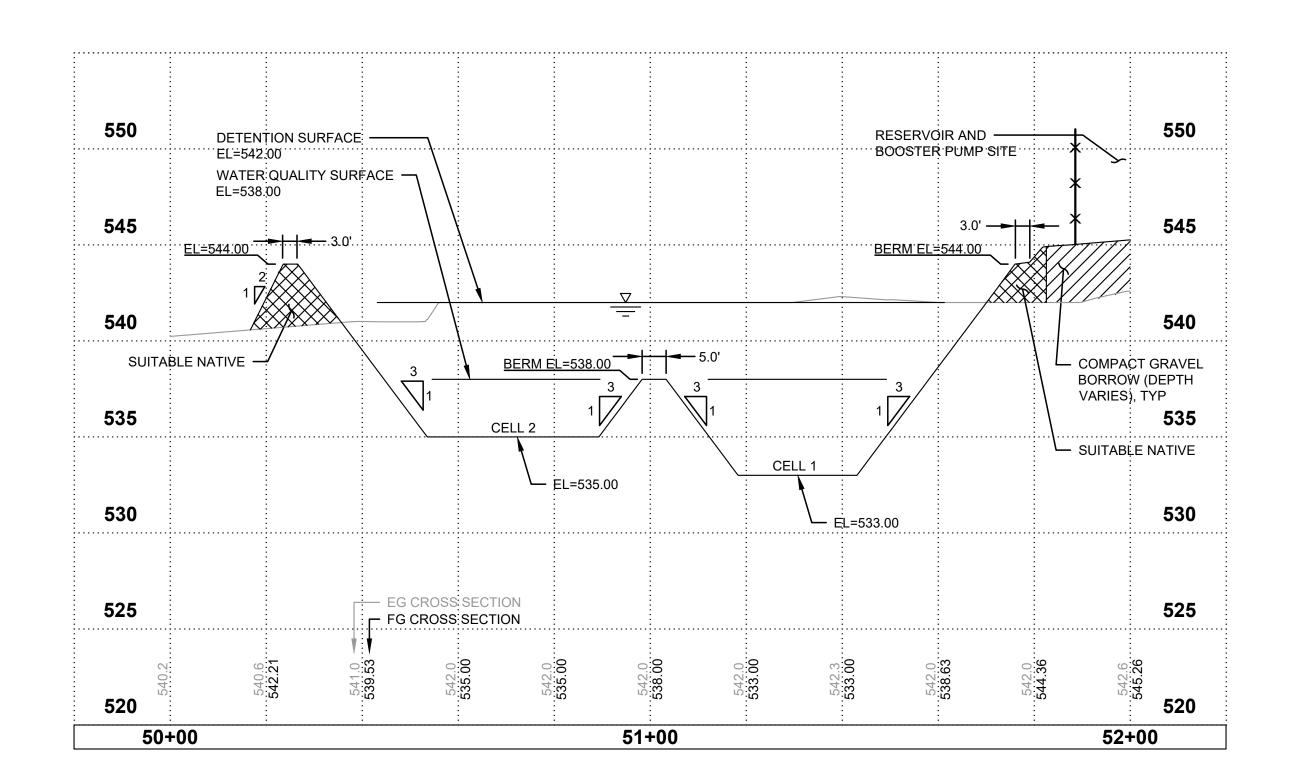
DRAWING: **C2-6** OF: **8**

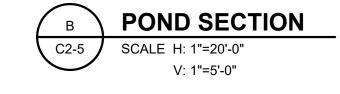
A POND SECTION

C2-5 SCALE H: 1"=20'-0"

V: 1"=5'-0"

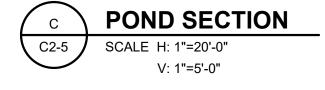




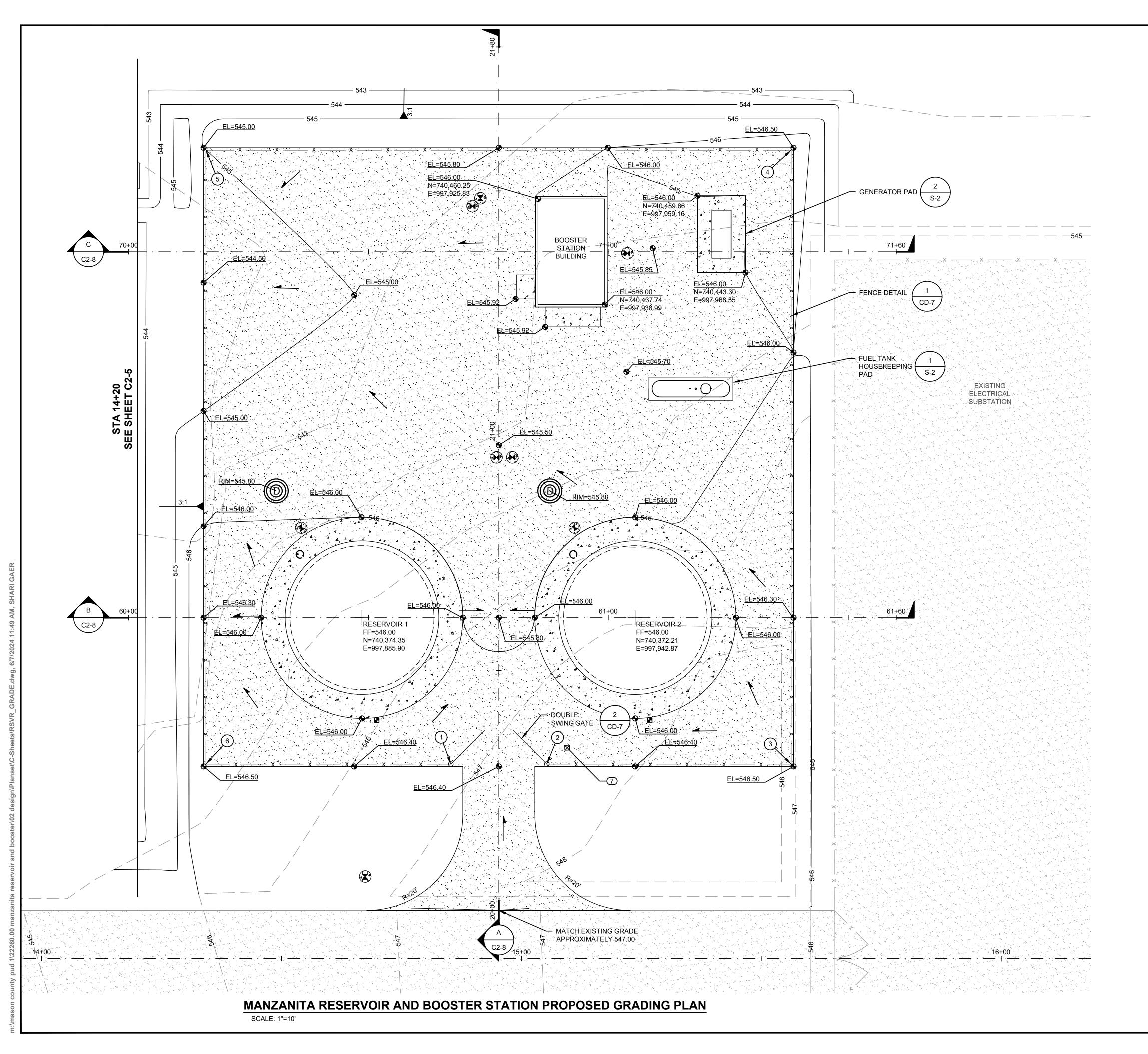


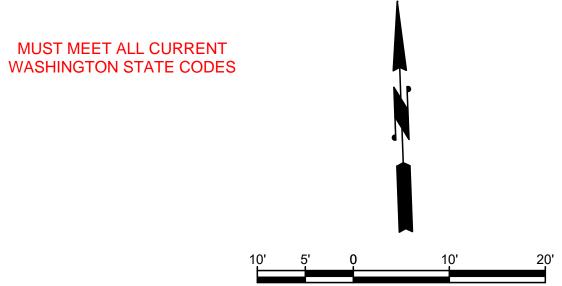
MUST MEET ALL CURRENT WASHINGTON STATE CODES

Reviewed for Code Compliance
Mason County Building
Department



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- 3. EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO CONSTRUCTION ACTIVITIES. SEE SHEET CD-1 AND CD-2.
- 4. ALL DISTURBED AREAS NOT SHOWN WITH GRAVEL RESTORATION SHALL BE HYDROSEEDED PER DETAIL 5 ON SHEET CD-3.
- 5. SEE SPECIFICATION SECTION 01110 FOR CONSTRUCTION TIMING LIMITATIONS.

FENCE SCHEDULE				
POINT #	ITEM	NORTHING & EASTING		
1	DOUBLE SWING GATE POST	N=740,343.18 E=997,903.25		
2	DOUBLE SWING GATE POST	N=740,342.43 E=997,923.23		
3	FENCE CORNER POST	N=740,340.51 E=997,974.19		
4	FENCE CORNER POST	N=740,468.42 E=997,979.00		
5	FENCE CORNER POST	N=740,473.00 E=997,857.09		
6	FENCE CORNER POST	N=740,345.09 E=997,852.28		

SEE GEOLOGICAL REPORT

GEOLOGICAL ENGINEERING SERICE

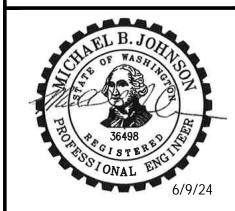
REPORT DATED: JUNE 7, 2022

MUST MEET OR EXCEED ALL REQUIREMENT PER GEOLOGICAL REPORT

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1681 E McREAVY RD UNION, WA

No. DATE REVISION

ISSUED FOR:

PERMIT SET

ISSUE DATE: JUNE 2024

APPROVED BY: MBJ

CHECKED BY: SLG

DRAWN BY: JPW

0 1" 2'
TWO INCHES AT FULL SCALE.
IF NOT, SCALE ACCORDINGLY

DESIGNER:

G & O JOB NO.:

SLG

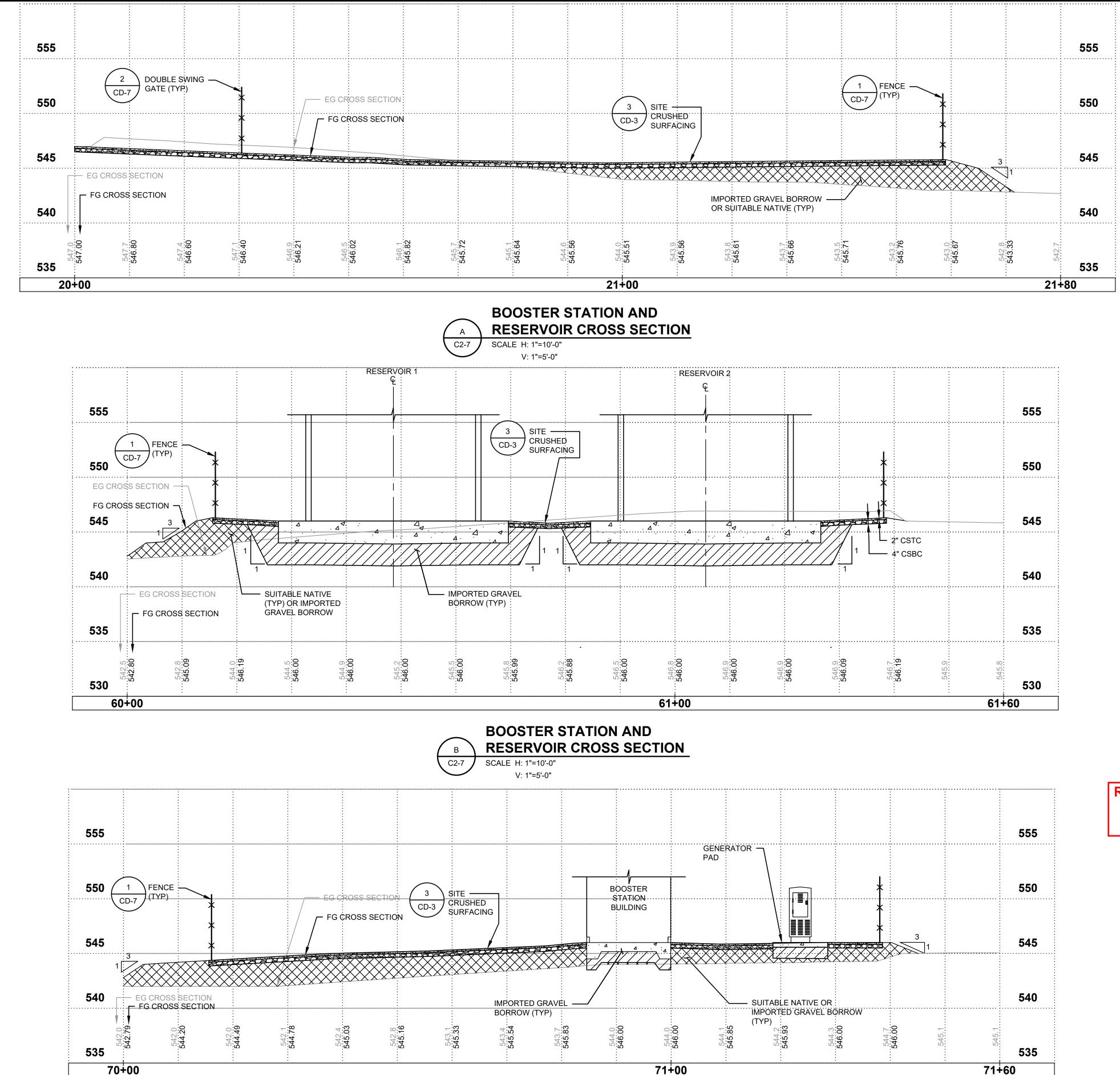
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RSVR_GRADE.DWG

CIVIL

RESERVOIR AND BOOSTER STATION GRADING PLAN

DRAWING: **C2-7** OF: **8**

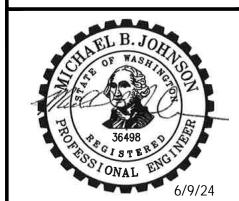


Gray & Osborne, Inc.

CONSULTING ENGINEERS

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(360) 292-7481

MUST MEET ALL CURRENT WASHINGTON STATE CODES



MASON COUNTY

PUD NO. 1

MANZANITA

RESERVOIR AND BOOSTER PUMP

STATION

1681 E McREAVY RD

UNION, WA

SEE GEOLOGICAL REPORT

GEOLOGICAL ENGINEERING SERICE

REPORT DATED: JUNE 7, 2022

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Code Compliance
Dunty Building

No. DATE REVISION

ISSUED FOR:

PERMIT SET

ISSUE DATE: JUNE 2024

APPROVED BY: MBJ

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IF NOT, SCALE ACCORDINGLY

CHECKED BY:

DRAWN BY:

DESIGNER:

G & O JOB NO.:

CIVIL

SLG

JPW

SLG

22260.00

RSVR_GRADE.DWG

RESERVOIR AND BOOSTER PUMP PROPOSED GRADING SECTIONS

DRAWING: **C2-8** OF: **8**

BOOSTER STATION AND
RESERVOIR CROSS SECTION

CC2-7 SCALE H: 1"=10'-0"
V: 1"=5'-0"

GENERAL NOTES FOR TARGETED DRAINAGE PLAN:

- 1. ALL GRADING SHALL COMPLY WITH PERMIT CONDITIONS, CURRENT MASON COUNTY PUD AND MASON COUNTY CODES AND DEPARTMENT OF ECOLOGY REQUIREMENTS, AND STATE (WSDOT) STANDARD SPECIFICATIONS, CURRENT EDITION.
- 2. IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY THE CONTRACTOR'S ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES THAT MAY BE NEEDED TO PROTECT THE NATURAL FEATURES OR ADJACENT PROPERTIES.
- THE TEMPORARY EROSION/SEDIMENTATION CONTROL FACILITIES SHALL BE CONSTRUCTED PRIOR TO ANY GRADING OR SITE WORK. THESE FACILITIES MUST BE SATISFACTORILY MAINTAINED UNTIL CONSTRUCTION AND LANDSCAPING IS COMPLETED AND WITHIN 30 DAYS OF FINAL SITE STABILIZATION OR UNTIL THE POTENTIAL FOR ON-SITE EROSION HAS PASSED.
- 4. ALL PERSONS ENGAGING IN CONSTRUCTION ACTIVITIES SHALL PREVENT OR MINIMIZE EROSION AND SEDIMENTATION ON-SITE, AND SHALL PROTECT PROPERTIES AND WATER COURSES DOWNSTREAM FROM THE SITE.
- NON COMPLIANCE WITH THE EROSION CONTROL REQUIREMENTS, WATER QUALITY REQUIREMENTS AND/OR CLEARING LIMITS MAY RESULT IN REVOCATION OF PROJECT PERMITS, REVOCATION OF PLAN APPROVAL, AND BOND FORECLOSURES.
- PRIOR TO INITIATION OF SITE WORK, HIGHLY VISIBLE MARKERS SUCH AS ORANGE BARRIER FENCING OR FLAGGING SHALL BE USED TO IDENTIFY CLEARING LIMITS AND EXISTING NGPA AREAS.
- 7. ALL STREETS SHALL BE KEPT CLEAR OF DIRT AND DEBRIS DURING EXCAVATION AND FILL OPERATIONS. SWEEP STREETS IMMEDIATELY WHEN DIRT HAS BEEN TRACKED ONTO PAVED SURFACES.
- 8. STOCKPILES ARE TO BE LOCATED IN SAFE AREAS AND ADEQUATELY PROTECTED WITHIN 24 HOURS OF FORMATION TO PREVENT SOIL LOSS.
- 9. STORM SEWER INLETS RECEIVING SITE STORM WATER RUNOFF DURING CONSTRUCTION SHALL BE PROTECTED SO THAT WATER WILL NOT ENTER THE INLET WITHOUT FIRST BEING FILTERED OR OTHERWISE TREATED TO MINIMIZE THE AMOUNT OF SEDIMENT ENTERING THE INLET.
- 10. FROM MAY 1 TO SEPTEMBER 30, NO SOIL SHALL REMAIN EXPOSED FOR MORE THAN 7 DAYS. DENUDED AREAS SHALL BE COVERED BY MULCH, SOD, PLASTIC OR EQUIVALENT BMP LISTED IN THE WASHINGTON STATE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON FROM OCTOBER 1 TO APRIL 30. NO SOIL SHALL REMAIN EXPOSED FOR MORE THAN 2 DAYS. SEE WET SEASON SUPPLEMENTAL GRADING NOTES FOR ADDITIONAL BMP REQUIREMENTS.
- 11. WATER RESULTING FROM THE DEWATERING OF TRENCHES AND EXCAVATIONS SHALL BE FILTERED PRIOR TO DISCHARGE AS REQUIRED TO MEET TURBIDITY PERMITS. DISCHARGE OF SURFACE WATER FROM THE SITE SHALL BE SUBJECT TO MONITORING BY THE OWNER, AND TREATMENT AND/OR DIVERSION TO THE SANITARY SEWER SYSTEM WHERE APPROPRIATE, IN ACCORDANCE WITH THESE PLANS AND PROJECT SPECIFICATIONS. MAXIMUM ALLOWABLE TURBIDITY SHALL BE 5 NTU OVER BACKGROUND. DIVERSION OF STORM WATER DISCHARGE TO THE SANITARY SEWER SYSTEM SHALL BE SUBJECT TO OWNERS APPROVAL AND TO ANY PRE-TREATMENT REQUIREMENTS IMPOSED BY THE OWNER.
- 12. CONTRACTOR IS RESPONSIBLE FOR PREVENTING SURFACE WATER FROM RUNNING INTO EXCAVATIONS AND/OR PUMPING SURFACE RUN-OFF FROM EXCAVATION AND WORK AREA AS NEEDED.
- 13. FILTER FABRIC FENCE AND ALL OTHER TESC MEASURES SHALL BE CHECKED IMMEDIATELY AFTER EACH RAINFALL EVENT IN EXCESS OF 0.1 INCH AND DAILY DURING PROLONGED RAIN EVENTS. MAINTENANCE AND REPAIR OF TESC FACILITIES AND STRUCTURES SHALL BE CONDUCTED IMMEDIATELY UPON RECOGNITION OF A PROBLEM OR DAMAGE. SEE ALSO NOTES ON SILTATION BARRIER MAINTENANCE, THIS SHEET.
- 14. SEDIMENT DEPOSITS SHALL BE REMOVED FROM ALL TEMPORARY DRAINAGE FACILITIES AND STRUCTURES UPON REACHING A DEPTH OF 6 INCHES.
- 15. SUFFICIENT TEST BMP MATERIALS AND SUPPLIES TO PROTECT THE ENTIRE SITE SHALL BE STOCK PILED ON SITE.
- 16. CONSTRUCTION ACCEPTANCE WILL BE SUBJECT TO PLACEMENT OF STRAW OR WOOD FIBER MULCH OR EROSION CONTROL BLANKETS THAT FULFILLS THE REQUIREMENT OF THE APPROVED CONSTRUCTION PLANS AND MASON COUNTY DRAINAGE STANDARDS.
- 17. IMMEDIATELY FOLLOWING FINISH GRADING, PERMANENT VEGETATION SHALL BE APPLIED. ALL DISTURBED AREAS NOT DESIGNATED FOR OTHER SURFACE RESTORATION SHALL BE MULCHED WITH STRAW OR WOOD FIBER MATERIAL.
- 18. IF REQUIRED, SURFACE RUNOFF CONTROL MEASURES SUCH AS GRADIENT TERRACES, INTERCEPTOR DIKE/SWALES, LEVEL SPREADERS, AND SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO MULCHING.
- 19. TRANSPORT ALL EXCAVATED MATERIALS OFF SITE TO APPROVED STORAGE LOCATION, EXCEPT AS ALLOWED IN THE SPECIFICATIONS. LIMIT TRUCK ACTIVITY TO PAVED AND GRAVELED SURFACES ONLY. MAINTAIN TRUCK ACCESS AREAS WHERE CLEAR OF DIRT AND SEDIMENT DURING PERIODS OF TRUCK ACTIVITY BY SWEEPING.
- 20. ADDITIONAL REQUIREMENTS FOR UTILITIES. THE INSTALLATION OF UNDERGROUND UTILITY LINES SHALL BE SUBJECT TO THE FOLLOWING ADDITIONAL REQUIRMENTS:
- a. NO MORE THAN FIVE HUNDRED (300) FEET OF TRENCH MAY REMAIN OPEN AT ONE TIME;
- b. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF THE TRENCHES UNLESS INCONSISTENT WITH SAFETY OR SITE CONSTRAINTS

CONSTRUCTION SEQUENCE:

- 1. ATTEND PRE-CONSTRUCTION MEETING.
- FLAG OR FENCE CLEARING LIMITS.
- 3. INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.)
- 4. CONSTRUCT SURFACE WATER CONTROLS IF NEEDED (INTERCEPTOR DIKES, STRAW WATTLES, ETC.) SIMULTANEOUSLY WITH CLEARING AND GRADING FOR WATER MAIN CONSTRUCTION
- 5. MAINTAIN EROSION CONTROL MEASURES IN ACCORDANCE WITH COUNTY REQUIREMENTS AND MANUFACTURER'S RECOMMENDATIONS.
- 6. 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 COUNTY REQUIREMENTS.
- COVER ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN TWO DAYS BETWEEN OCTOBER 1ST AND APRIL 30TH OR SEVEN DAYS BETWEEN MAY 1ST AND SEPTEMBER 30TH WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING OR EQUIVALENT.
- 8. STABILIZE ALL AREAS WITHIN SEVEN DAYS OF REACHING FINAL GRADE.
- 9. PLACE STRAW OR FIBER MULCH ON ANY AREAS TO REMAIN UNWORKED FOR MORE THAN 30 DAYS.
- 10. UPON COMPLETION OF THE PROJECT, STABILIZE ALL DISTURBED AREAS AND REMOVE BMPS WHEN APPROPRIATE.

WET SEASON SUPPLEMENTAL GRADING NOTES (OCTOBER 1 THROUGH APRIL 30)

- CONSTRUCTION SEQUENCE SHALL BE MODIFIED TO MINIMIZE THE AREA OF UNSTABILIZED SOIL, WITH A MAXIMUM OF 1,000 SQUARE FEET EXPOSED AT ANY TIME.
- 2. EARTHEN AREAS WITH THE POTENTIAL TO CONTRIBUTE SEDIMENTS DURING STORM EVENTS AND WHERE EARTH MOVEMENT IS NOT ANTICIPATED WITHIN 48-HOURS SHALL BE STABILIZED USING ONE OR MORE OF THE FOLLOWING BMPS INSTALLED IN ACCORDANCE WITH THE CURRENT MASON COUNTY DRAINAGE MANUAL: STRAW MULCH OF 4" THICKNESS, PLASTIC SHEETING, EROSION CONTROL BLANKETS.
- WET SEASON TEST MEASURES SHALL BE EXPANDED TO INCLUDE:
- a. IMPLEMENT A PLAN TO PUMP TURBID WATER TO THE SANITARY SEWER SYSTEM OR TO PUMP TO ON SITE TANKS AND TREAT PRIOR TO DISCHARGE TO THE STORM SYSTEM. THE PLAN SHALL BE PRE-APPROVED BY THE OWNER PRIOR TO START OF WET SEASON GRADING AND SHALL BE SUBJECT TO MONITORING BY THE OWNER AS DESCRIBED IN THE SPECIFICATIONS. PUMPING TO THE SANITARY SEWER SYSTEM SHALL REQUIRE OWNERS APPROVAL AND SHALL BE SUBJECT TO SUCH CONDITIONS AS THE OWNER MAY IMPOSE, AS DESCRIBED IN THE SPECIFICATIONS.
- b. STOCKPILE BUILDING MATERIALS ON PAVED AND/OR GRAVELED SURFACES TO MINIMIZE TRAFFIC ON ERODABLE SURFACES.
- 4. SOILS SHALL NOT BE DISTURBED EXCEPT FOR CONSTRUCTION ACTIVITIES. PARKING IS ALLOWED ONLY ON PAVED AND/OR GRAVELED SURFACES.
- 5. SLOPES WITHOUT ESTABLISHED GROUND COVER SHALL BE STABILIZED WITH PLASTIC SHEETING, 6 MIL. MINIMUM. SHEETING SHALL BE ANCHORED WITH SANDBAGS LOCATED 5 FEET APART ON THE PERIMETER AND 10 FEET ON CENTER ELSEWHERE ON THE SHEETING. A MINIMUM OF 2 FEET OVERLAP IS REQUIRED FOR OVERLAPPING SHEETS.
- 6. WHEN RAINFALL IS HEAVY (DEFINED AS SUFFICIENT TO PRODUCE SEDIMENT RUNOFF FROM EXPOSED DIRT), ALL EXPOSED EARTHWORK SHALL BE COVERED. NO OTHER CONSTRUCTION ACTIVITY SHALL OCCUR ON PERVIOUS SURFACES DURING THESE PERIODS OF HEAVY RAINFALL.
- 7. ALL DRAINAGE SWALES AND AREAS WITH 2:1 OR GREATER SLOPES SHALL BE LINED WITH STAKED EROSION CONTROL BLANKETS.

CLEAR PLASTIC COVERINGS:

- 1. CLEAR PLASTIC COVERINGS SHALL HAVE A MINIMUM THICKNESS OF 6 MIL AND MEET THE REQUIREMENTS OF WSDOT/APWA SECTION 9-14.5.
- 2. COVERING SHALL BE INSTALLED AND MAINTAINED TIGHTLY IN PLACE BY USING SANDBAGS OR TIRES OR ROPES WITH A MAXIMUM 10 FOOT GRID SPACING IN ALL DIRECTIONS. ALL SEAMS SHALL BE TAPED OR WEIGHTED DOWN FULL LENGTH AND THERE SHALL BE AT LEAST A 1 TO 2 FOOT OVERLAP OF ALL SEAMS. SEAMS SHOULD THEN BE ROLLED AND STAKED OR TIED.
- 3. WHEN THE COVERING IS USED ON BARE SOIL SLOPES, IT SHALL BE LEFT IN PLACE UNTIL STRAW OR WOOD FIBER MULCH IS APPLIED.
- 4. SHEETING SHOULD BE TOED IN AT THE TOP OF THE SLOPE TO PREVENT SURFACE FLOW BENEATH THE PLASTIC.
- SHEETING SHOULD BE REMOVED AS SOON AS IS POSSIBLE TO PREVENT BURNING THE VEGETATION.
- 6. CHECK SHEETING REGULARLY FOR RIPS AND PLACES WHERE THE PLASTIC MAY BE DISLODGED. CONTACT BETWEEN THE PLASTIC AND THE GROUND SHOULD ALWAYS BE MAINTAINED. ANY AIR BUBBLES FOUND SHOULD BE REMOVED IMMEDIATELY OR THE PLASTIC MAY RIP DURING THE NEXT WINDY PERIOD. RE-ANCHOR OR REPLACE THE PLASTIC AS NECESSARY.

FILTER FENCE:

- 1. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6 INCH OVERLAP, AND BOTH ENDS SECURELY FASTENED TO THE POST.
- 2. POSTS SHALL BE SPACED A MAXIMUM OF 6 FEET APART AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 30 INCHES (WHERE PHYSICALLY POSSIBLE).
- 3. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 8 INCHES WIDE AND 8 INCHES DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER. THE TRENCH SHALL BE CONSTRUCTED TO FOLLOW THE CONTOUR.
- WHEN SILT FILM FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING TIE WIRES, HOG RINGS, OR HEAVY-DUTY WIRE STAPLES AT LEAST 1 INCH LONG. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4 INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
- 5. SILT FILM FILTER FABRIC SHALL BE WIRED TO THE FENCE, AND 20 INCHES OF THE FABRIC SHALL EXTEND INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES. OTHER TYPES OF FABRIC MAY BE STAPLED TO THE FENCE.
- 6. WHEN EXTRA-STRENGTH OR MONOFILAMENT FABRIC AND CLOSER POST SPACING ARE USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF FILTER FENCE NOTE 5 APPLYING. EXTRA CARE SHOULD BE USED WHEN JOINING OR OVERLAPPING THESE STIFFER FABRICS.
- 7. THE BASE OF THE SILT FENCE SHALL BE SECURED WITH COMPACTED NATIVE SOIL OR 3/4" MIN DIA WASHED GRAVEL. THE MATERIAL SHALL BE WELL BEDDED TO ENSURE GOOD CONTACT BETWEEN THE FABRIC AND THE TRENCH BOTTOM.
- 8. FILTER FABRIC FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED. RETAINED SEDIMENT MUST BE REMOVED AND PROPERLY DISPOSED OF AND MULCHED.

FILTER FENCE MAINTENANCE

- 1. INSPECT IMMEDIATELY AFTER EACH RAINFALL, AND AT LEAST DAILY DURING PROLONGED RAINFALL. REPAIR AS NECESSARY.
- SEDIMENT MUST BE REMOVED WHEN IT REACHES APPROXIMATELY ONE THIRD THE HEIGHT OF THE FENCE, ESPECIALLY IF HEAVY RAINS ARE EXPECTED.
- ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE FILTER FENCE IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED AND MULCHED.
- ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY "BEST MANAGEMENT PRACTICES" ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON SITE. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED.

SEE GEOLOGICAL REPORT

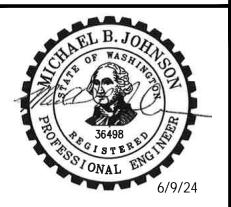
ENGINEERING SERICE

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OLYMPIA, WA 98502
(360) 292-7481





PUD NO. 1 MANZANITA RESERVOIR AND BOOSTER PUMP STATION 1681 E McREAVY RD UNION, WA

REVISION

PERMIT SET

JUNE 2024

SLG

JPW

SLG

22260.00

DETAILS.DWO

MUST MEET ALL CURRENT WASHINGTON STATE CODES

Reviewed for Code Compliance
Mason County Building
Department

CIVIL DETAILS

No. DATE

ISSUED FOR:

ISSUE DATE:

APPROVED BY:

CHECKED BY:

DRAWN BY:

DESIGNER:

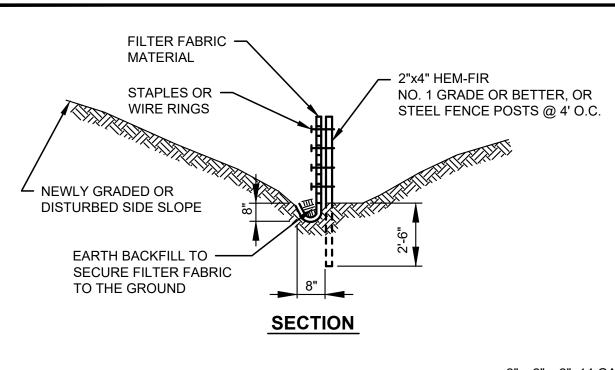
G & O JOB NO .:

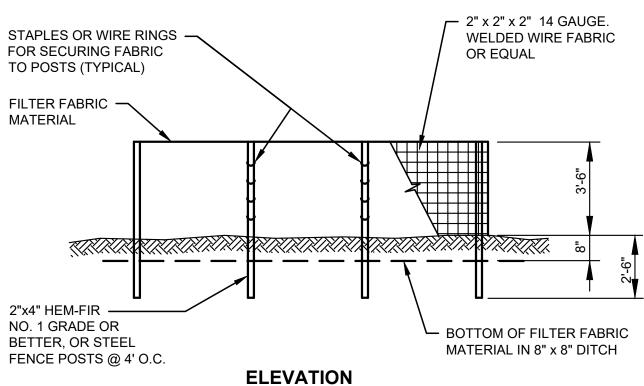
TESC NOTES

DRAWING: CD-1 OF: 7

ason county pud 1\22260.00 manzanita reservoir and booster\02 design\Planset\C-Sheets\DETAILS.dwg, 6

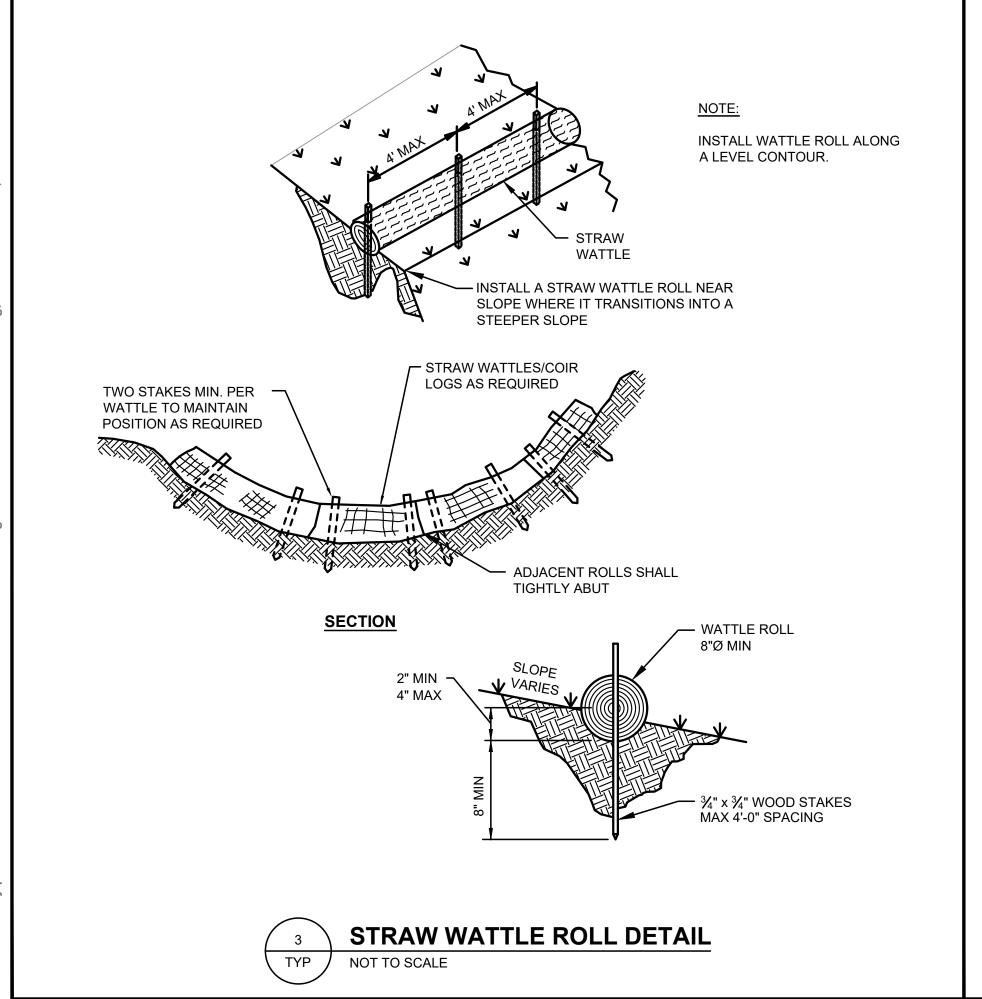
Engineering and Architectural Drawings
Construction must match all designs and apecifications of the
Architectural and or the Engineering requirements OR a stamped letter o
approval must be provided from the design professional responsible for
the work that has been altered. ***NOTE: Structural engineering shall
supersede Mason County "Typical" notes for structural items.***

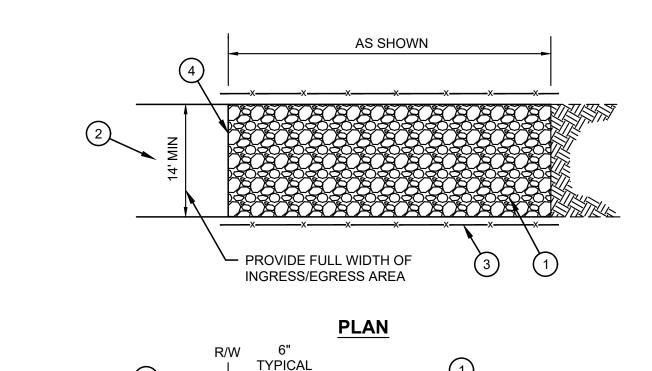




- 1. WHERE POSSIBLE, MAINTAIN NATURAL VEGETATION FOR SILT CONTROL
- 2. TEMPORARY SILTATION CONTROL SHALL BE CONSTRUCTED BY PLACING FILTER FABRIC FENCES ACROSS SWALES UTILIZING FILTER SYSTEM PRIOR TO DISCHARGE
- 3. BE MAINTAINED IN A SATISFACTORY CONDITION UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND SURFACE RESTORATION HAS BEEN COMPLETED
- 4. RETURN SILTATION CONTROL AREAS TO ORIGINAL GROUND CONDITIONS, UNLESS SPECIFICALLY DIRECTED OTHERWISE BY THE ENGINEER







EX. ROAD

GENERAL NOTES:

DETAIL NOTES:

- (1) 4" TO 8" QUARRY SPALLS AS SPECIFIED IN SECTION 9-13.6 OF THE WSDOT STANDARD SPECIFICATIONS.
- 2 ATB DRIVEWAY RAMP, OR SITE ACCESS ROAD. QUARRY SPALL ENTRANCE WIDTH AND LENGTH PER PLAN.
- 3 INSTALL ORANGE BARRIER FENCE TO DIRECT TRAFFIC ONTO CONSTRUCTION ENTRANCE.
- 4 FILTER FABRIC (GEOTEXTILE FABRIC) SHALL BE INSTALLED BENEATH THE ENTIRE CONSTRUCTION ENTRANCE AND SHALL CONFORM TO THE FOLLOWING PROPERTIES:

PROPERTY	<u>UNIT</u>	TEST METHOD	RESULT
WEIGHT	OZ/SY	ASTM D3776	2.5 MIN.
THICKNESS	MILS	ASTM D1776	15 MIN.
GRAB STRENGTH	LB	ASTM D1682	100 MIN.
UV RESISTANCE	%	ASTM D1682	90 MIN.
RETENTION EFFICIENCY	%	VIRGINIA DOT VTM-51	75 MIN.
EQUIVALENT SIZE	U.S. STD. SIEVE	COE CW 02215	20
OPENING			

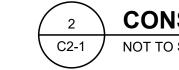
- 1. INSTALLATION THE AREA OF THE ENTRANCE SHALL BE CLEARED OF ALL VEGETATION, ROOTS AND OTHER OBJECTIONABLE MATERIAL. THE GRAVEL SHALL BE PLACED TO THE SPECIFIED DIMENSIONS. ANY DRAINAGE FACILITIES REQUIRED BECAUSE OF WASHING SHOULD BE CONSTRUCTED ACCORDING TO SPECIFICATIONS IN THE PLAN. IF WASH RACKS ARE USED, THEY SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
- 2. SURFACE WATER ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A DRIVABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
- 3. MAINTENANCE THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY.
- 4. WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS USED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
- 5. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

Reviewed for Code Compliance

Mason County Building

Department

SECTION



CONSTRUCTION ENTRANCE

NOT TO SCALE

Engineering and Architectural Drawings Construction must match all designs and apecifications of the nitectural and or the Engineering requirements OR a stamped letter or roval must be provided from the design professional responsible for the work that has been altered. ***NOTE: Structural engineering shall supersede Mason County "Typical" notes for structural items.***

> MUST MEET ALL CURRENT WASHINGTON STATE CODES

> > **SEE GEOLOGICAL REPORT**

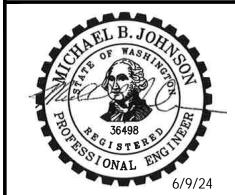
> > > **GEOLOGICAL ENGINEERING SERICE**

REPORT DATED: **JUNE 7, 2022**

MUST MEET OR EXCEED ALL REQUIREMENT PER GEOLOGICAL REPORT

Gray & Osborne, Inc 2102 CARRIAGE DRIVE SW, **BUILDING I** OLYMPIA, WA 98502

(360) 292-7481





PUD NO. 1 MANZANITA **RESERVOIR AND BOOSTER PUMP** STATION 1681 E McREAVY RD UNION, WA

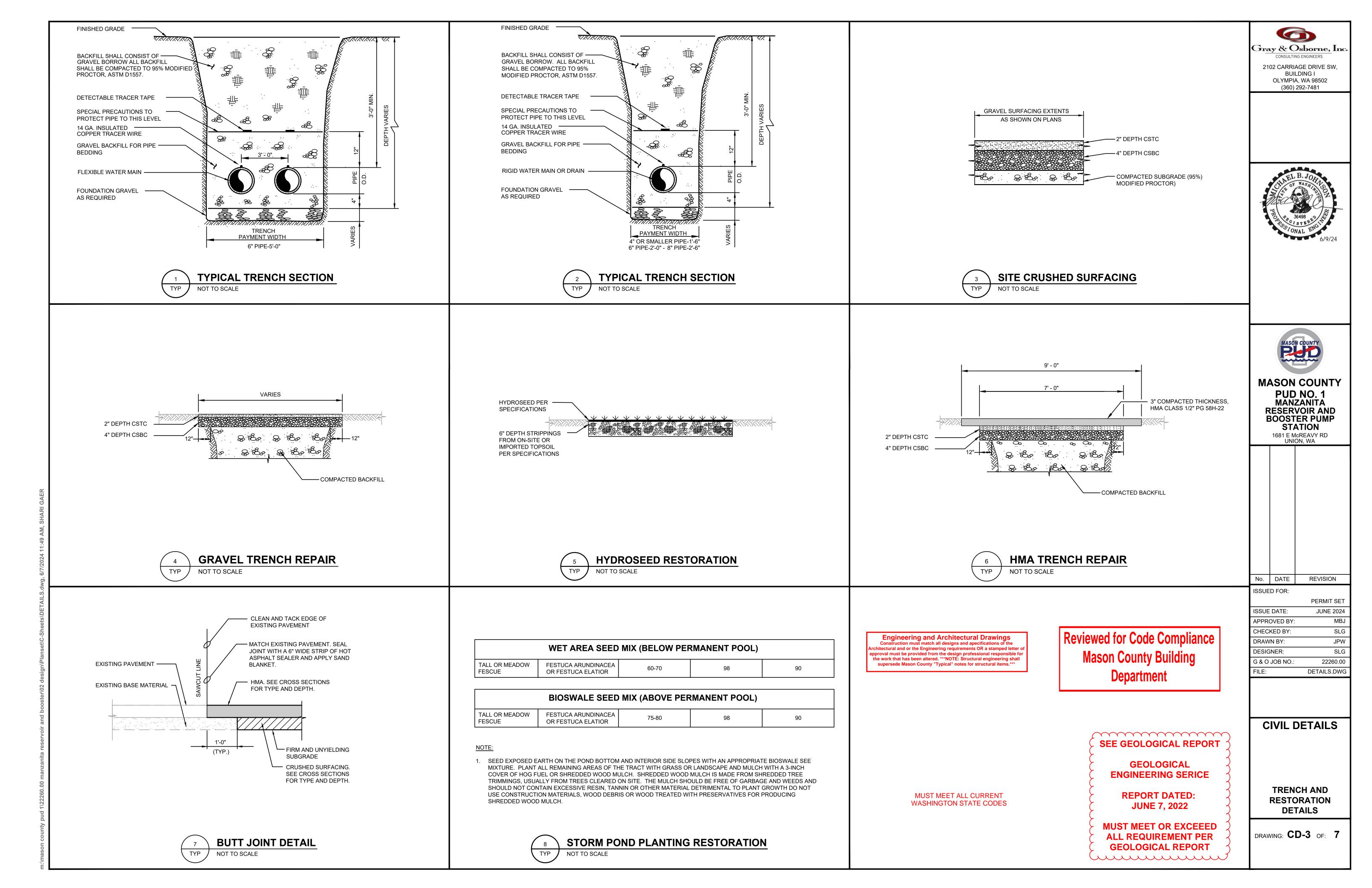
REVISION No. DATE

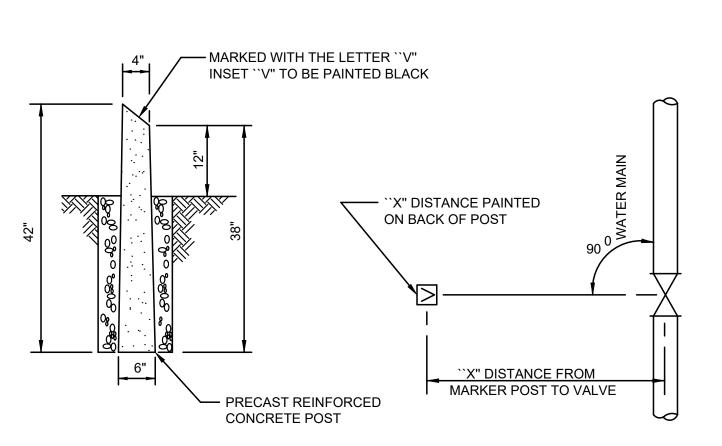
ISSUED FOR: PERMIT SET ISSUE DATE: JUNE 2024 APPROVED BY: CHECKED BY: SLG JPW DRAWN BY: SLG DESIGNER: G & O JOB NO.: 22260.00 DETAILS.DWG

CIVIL DETAILS

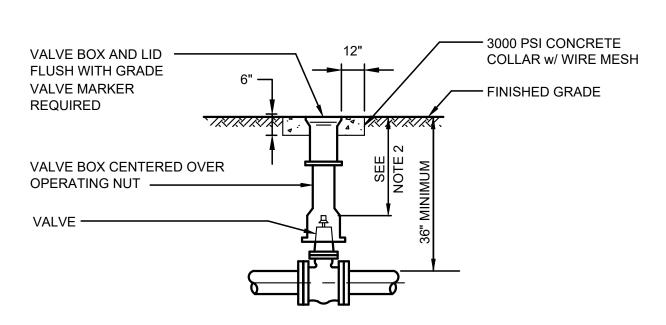
TESC DETAILS

DRAWING: CD-2 OF: 7



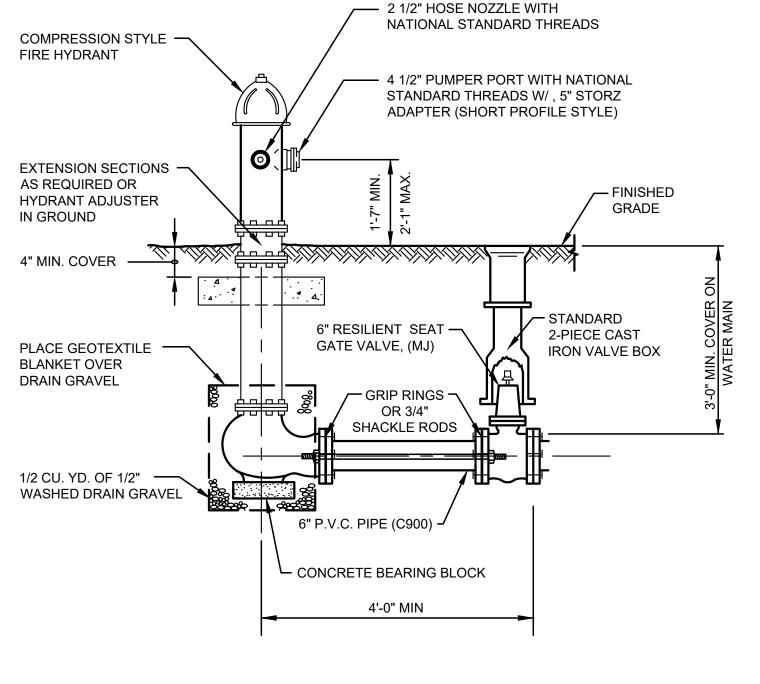


- 1. PRECAST REINFORCED POST TO BE PAINTED FLAT TRAFFIC YELLOW #2612 OR SAFETY YELLOW #1063.
- 2. THE DISTANCE FROM THE MARKER POST TO THE WATER MAIN SHALL BE PAINTED ON THE BACKSIDE OF THE MARKER POST IN BLACK WITH A 2" HIGH NUMBER.
- 3. VALVE MARKER POST SHALL BE REQUIRED WHENEVER THE WATER VALVE IS LOCATED IN AN UNPAVED AREA.
- 4. THE POST WILL ALSO BE REQUIRED FOR BLOW-OFF IN THE SAME CONDITION AS WATER VALVES.



VALVE BOX IN UNIMPROVED AREA (VALVE MARKER REQUIRED)

- 1. EACH VALVE SHALL BE PROVIDED WITH AND ADJUSTABLE CAST IRON VALVE BOX OF 5 INCHES (5") INSIDE DIAMETER. VALVE BOXES SHALL HAVE A TOP SECTION WITH AN EIGHTEEN INCH (18") MIN. LENGTH. THE VALVE BOX SHALL BE RICH No. 940 OR EQUAL. VALVE BOX EARS SHALL BE PLACED IN LINE WITH PIPE IT
- 2. 18" MINIMUM, 24" MAXIMUM DEPTH TO OPERATOR NUT PROVIDE EXTENSION IS REQUIRED.



NOTES:

- 1. PROVIDE MIN. 3'-0" CLEARANCE AND LEVEL AREA AROUND HYDRANT.
- 2. PAINT FIRE HYDRANT WITH TWO COATS OF YELLOW RUST-RESISTANT PAINT.

MUST MEET ALL CURRENT WASHINGTON STATE CODES

MUST MEET OR EXCEED

ALL REQUIREMENT PER GEOLOGICAL REPORT

3. ACCEPTABLE HYDRANTS: MUELLER CENTURION.



Gray & Osborne, Inc.

CONSULTING ENGINEERS

2102 CARRIAGE DRIVE SW, **BUILDING I**

OLYMPIA, WA 98502

(360) 292-7481

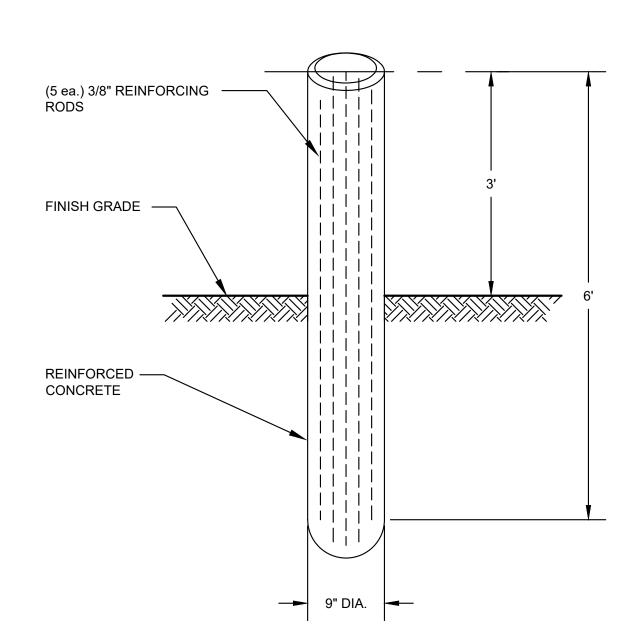
MANZANITA RESERVOIR AND BOOSTER PUMP STATION 1681 E McREAVY RD UNION, WA





Engineering and Architectural Drawings
Construction must match all designs and apecifications of the irements OR a stamped letter of ectural and or the Engine roval must be provided from the the work that has been altered. * OTE: Structural engineering shall supersede Mason County "Typical" notes for structural items.***



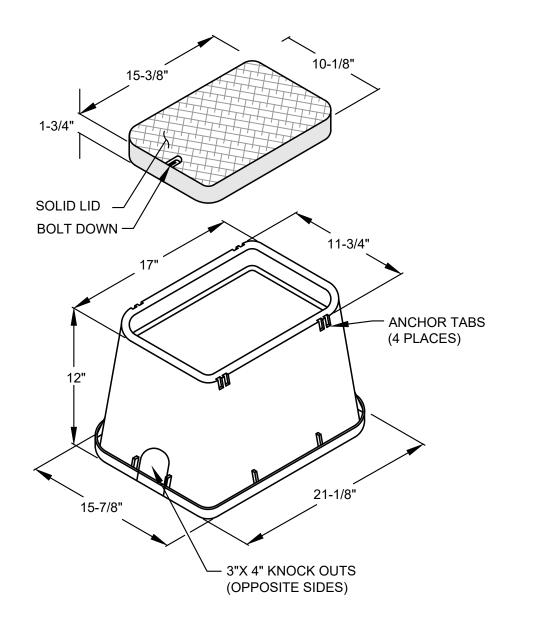


NOTES:

TYP

- 1. HYDRANTS POSTS SHALL CONSIST OF REINFORCED 9" DIA. PRECAST UNIT SPECIFICALLY MANUFACTURED FOR PROTECTION OF HYDRANTS.
- 2. THE CONFIGURATION OF THE GUARD POST WILL BE 2, 3, OR 4 EACH HYDRANT AND SHALL BE DETERMINED BY THE DISTRICT BASED ON FIELD CONDITIONS.
- 3. HYDRANT GUARD POSTS SHALL BE PAINTED WITH TWO (2) COATS OF "STEELCOTE FEDERAL YELLOW" PAINT.

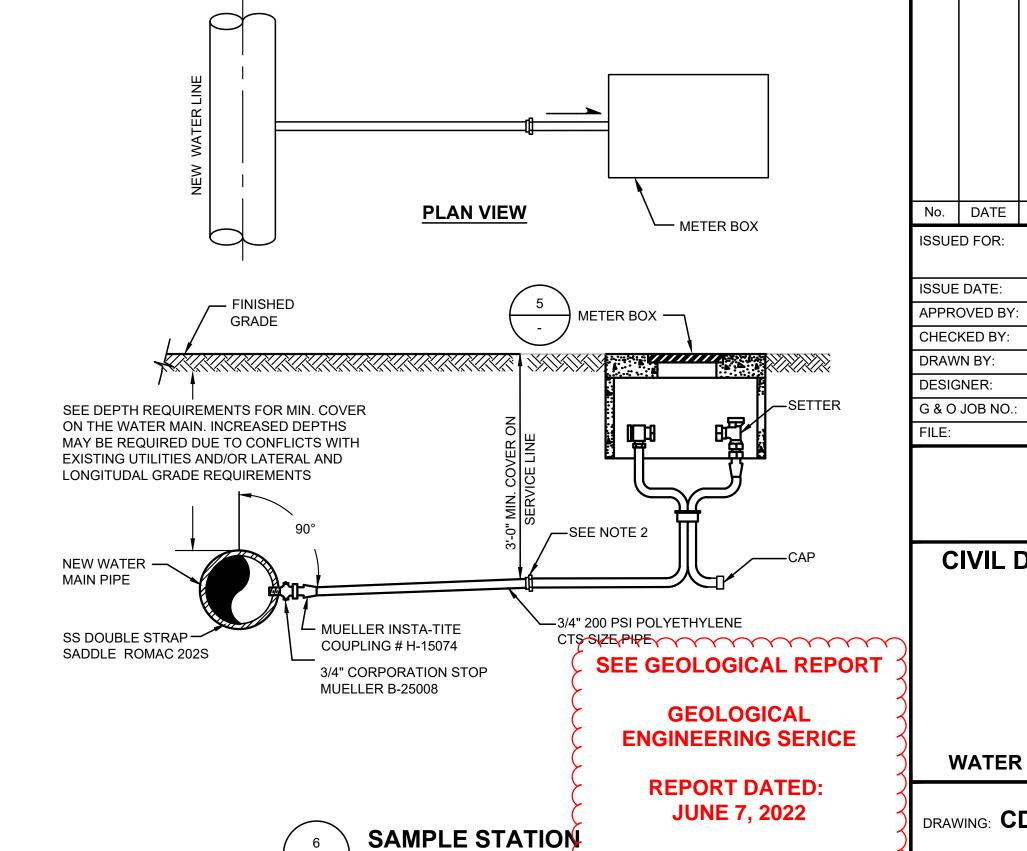
Reviewed for Code Compliance **Mason County Building Department HYDRANT GUARD POST** NOT TO SCALE



NOTE:

1. CARSON MODEL 1419 W/ METER READING COVER OR EQUAL COVER MUST DISPLAY "W.M." OR EQUAL.





NOT TO SCALE

TYP

CIVIL DETAILS

REVISION

PERMIT SET

JUNE 2024

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JPW

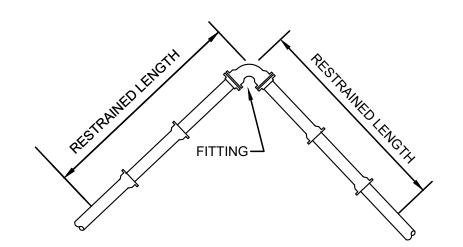
SLG

22260.00

DETAILS.DWG

WATER DETAILS

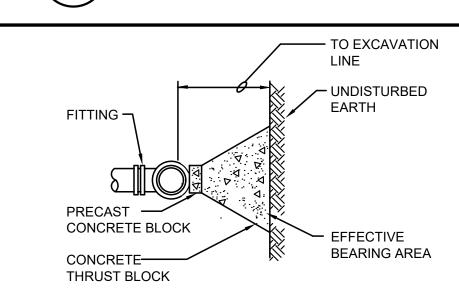
DRAWING: CD-4 OF: 7



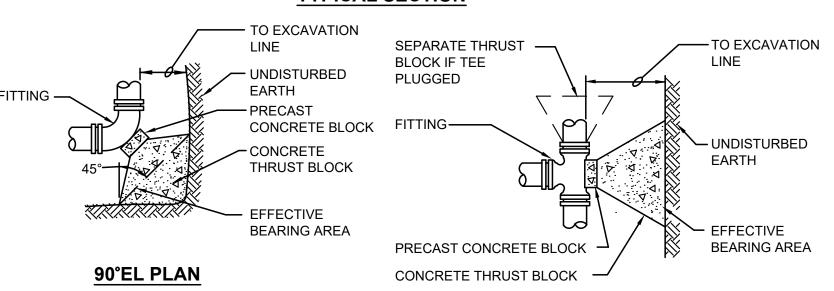
PIPE SIZE	90° BEND	== .,=			
	RESTRAINED LENGTH IN FEET (ONE SIDE)				
6"	30	13	6		

- 1. RESTRAINED JOINT PIPE AND FITTINGS MAY BE USED IN LIEU OF THRUST BLOCKS IF RESTRAINED JOINT PIPE IS USED, THE CONTRACTOR SHALL RESTRAIN JOINTS FOR THE DISTANCES SHOWN IN THE ABOVE TABLES.
- 2. RESTRAINED LENGTHS SHOWN ARE MINIMUM AND FOR LINEAL FEET REQUIRED ON EACH SIDE OF FITTING INDICATED.
- 3. FOOTAGES ARE BASED ON 250 PSI PRESSURE AND 36" INCHES COVER. IF PRESSURE IS GREATER OR COVER IS LESS, THE RESTRAINED LENGTH SHALL BE INCREASED.

ALTERNATIVE THRUST RESTRAINT NOT TO SCALE



TYPICAL SECTION



TEE PLAN

EFFECTIVE BEARING AREA REQUIRED

				•	
FITTING D	TEE	90°	45°	22 1/2°	11 1/4°
3"	4 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.	2 SQ. FT.
4"	4 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.	2 SQ. FT.
6"	4 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.	2 SQ. FT.
8"	7 SQ. FT.	10 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.

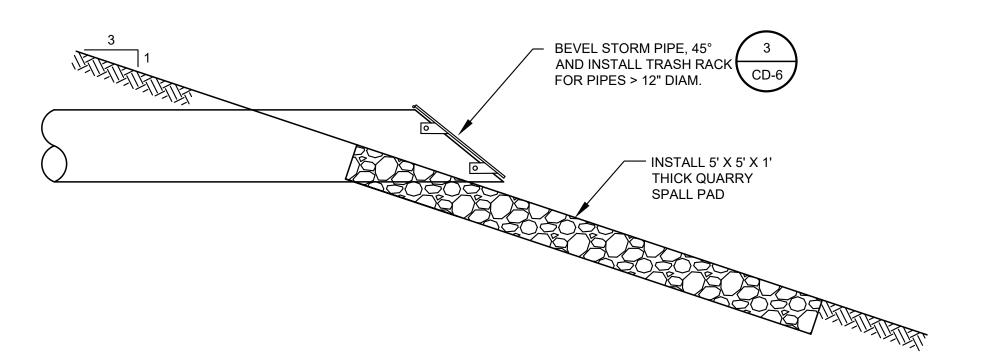
TYPICAL FOR SANDY SOIL WITH 2,000 P.S.F. BEARING STRENGTH & 100 P.S.I. WORKING PRESSURE. ADJUST BEARING AREA BY PRESSURE & SOIL BEARING CAPACITY. USE TEE FOR DEAD ENDS.

NOTES:

1. BLOCKING SHALL BE TO SOLID BEARING SURFACE.

- 2. FITTING SHALL BE PROTECTED WITH A POLYTHENE ENCASEMENT.
- 3. BEARING SHALL BE PROPORTIONALLY INCREASED WITH PRESSURES IN EXCESS OF 100
- P.S.I OR IN SOIL CONDITIONS WITH LESS THAN 2,000 P.S.F BEARING STRENGTH.
- 4. ALL BLOCKS ON TEES SHALL BE SEPARATED FOR DIRECTION OF THRUST.





BUILDING AND VAULT DRAIN AND RESERVOIR OVERFLOW DRAIN OUTLET NOT TO SCALE

SEE GEOLOGICAL REPORT

> **GEOLOGICAL ENGINEERING SERICE**

> > **REPORT DATED: JUNE 7, 2022**

MUST MEET OR EXCEED ALL REQUIREMENT PER

GEOLOGICAL REPORT

MASON COUNTY

PUD NO. 1

MANZANITA

RESERVOIR AND

BOOSTER PUMP

STATION

1681 E McREAVY RD UNION, WA

Gray & Osborne, Inc.

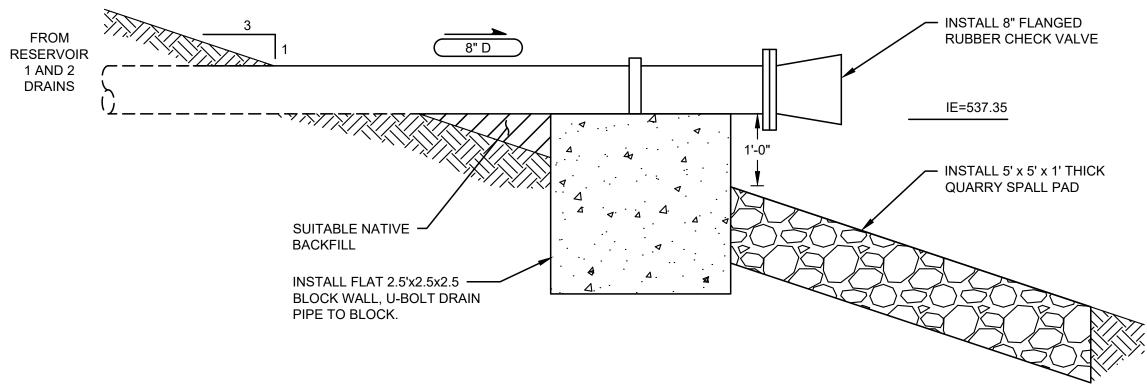
2102 CARRIAGE DRIVE SW,

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OLYMPIA, WA 98502

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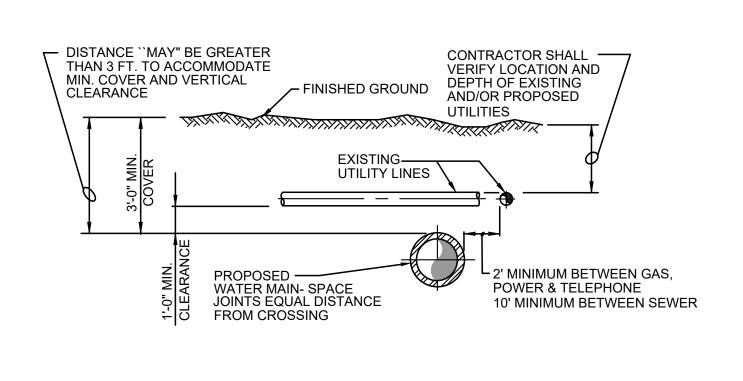
MUST MEET ALL CURRENT **WASHINGTON STATE CODES**



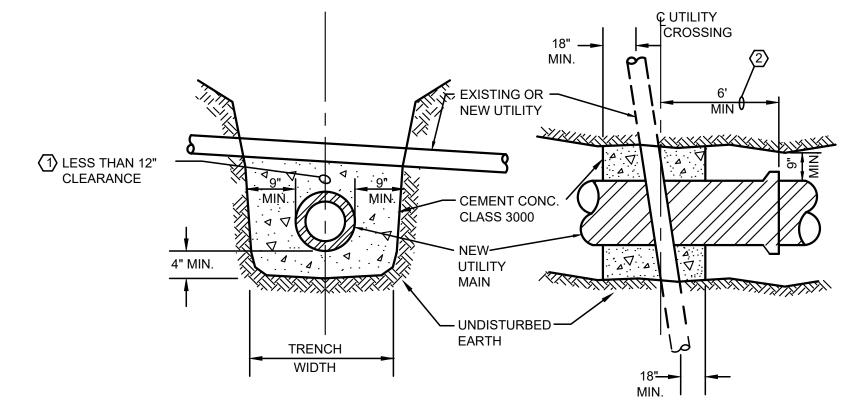


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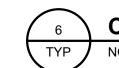
Reviewed for Code Compliance **Mason County Building Department**







- 1. CONTRACTOR SHALL PROVIDE CONCRETE PIPE ENCASEMENT AT ALL EXISTING UTILITY CROSSINGS IN THE EVENT THAT A 12" SEPARATION CANNOT BE PROVIDED. THE CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE SITE UTILITIES TO ANTICIPATE PROVIDING AND INSTALLING CONCRETE ENCASEMENTS WHERE NECESSARY.
- 2. CONTRACTOR SHALL NOT CONSTRUCT ANY NEW PIPE JOINT WITHIN 6 FEET OF THE EXISTING CENTERLINE OF THE UTILITY CROSSING.



CONCRETE PIPE ENCASEMENT DETAIL

DRAWN BY: JPW DESIGNER: SLG G & O JOB NO.: 22260.00 DETAILS.DWG

ISSUE DATE: NOVEMBER 2024

REVISION

PERMIT SET

SLG

No. DATE

ISSUED FOR:

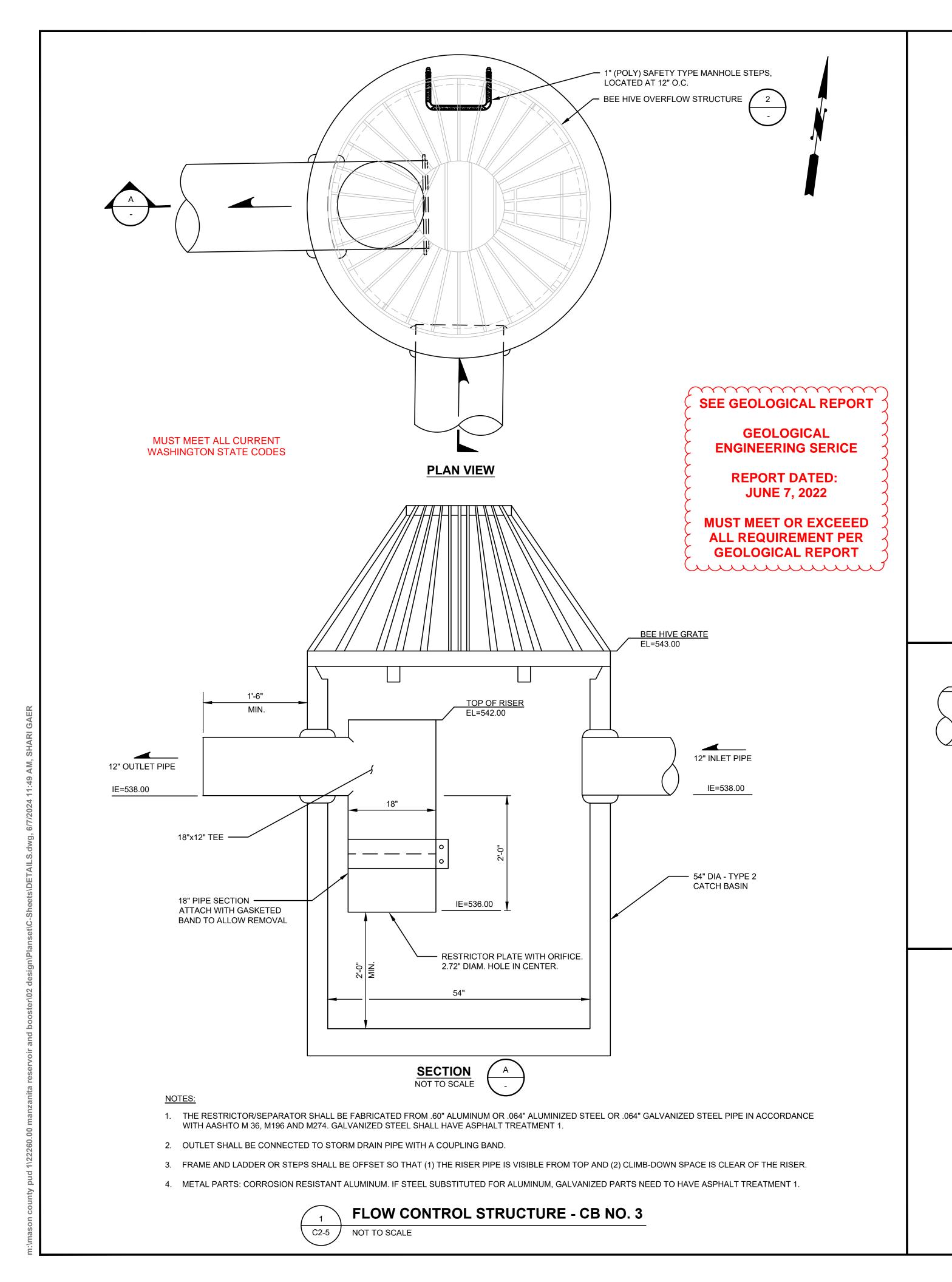
APPROVED BY:

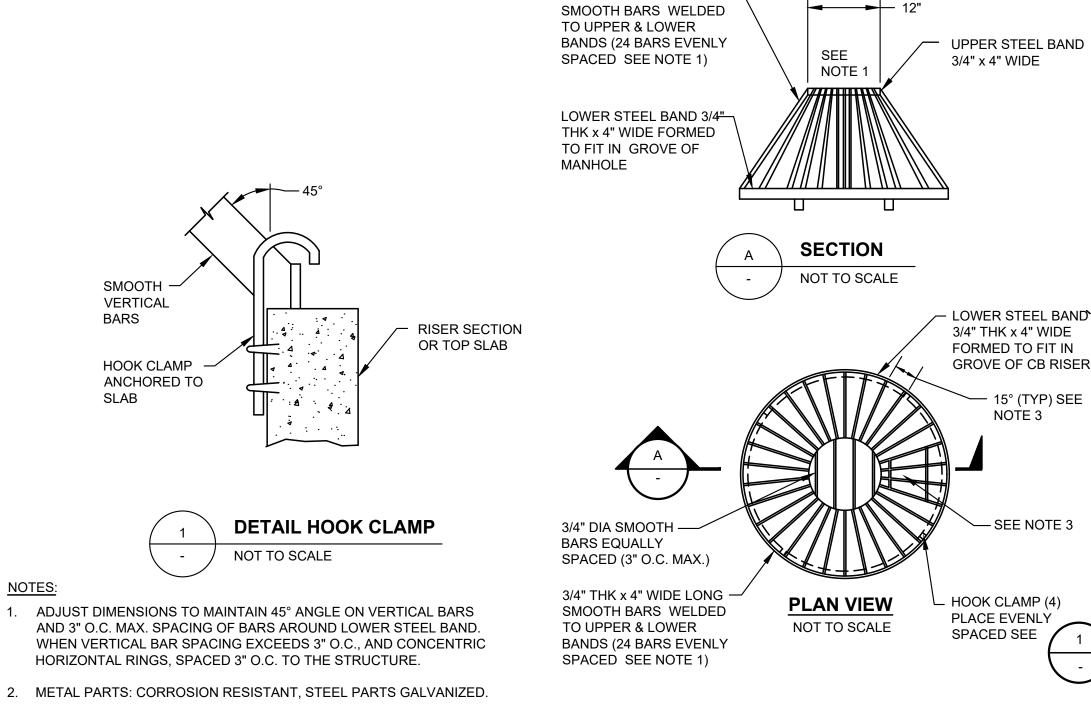
CHECKED BY:

CIVIL DETAILS

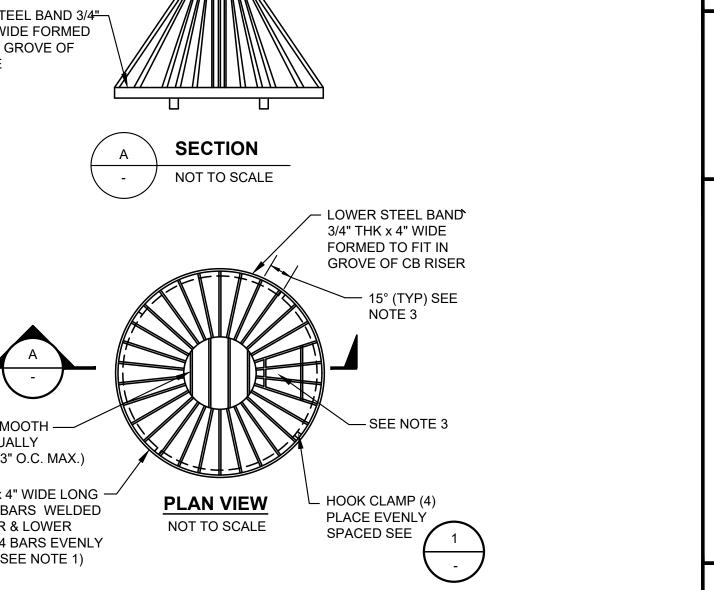
DRAINAGE AND **MISCELLANEOUS DETAILS**

DRAWING: CD-5 OF: 7





3/4" THK x 4" WIDE LONG —



Department

Reviewed for Code Compliance **Mason County Building MASON COUNTY**

PUD NO. 1 **MANZANITA RESERVOIR AND BOOSTER PUMP** STATION 1681 E McREAVY RD

UNION, WA

Gray & Osborne, Inc.

2102 CARRIAGE DRIVE SW,

BUILDING I

OLYMPIA, WA 98502 (360) 292-7481

BEE HIVE OVERFLOW STRUCTURE DETAIL NOT TO SCALE

6" CLEAR FROM DEBRIS BARRIER - 3/4" DIAM. BAR FRAME TO FINISHED GRADE REMOVABLE RACK 1/2" SCH 40 ALUM. PIPE (3/4" O.D.) 6" O.C. ROLLED SMOOTH Within ! 16 GA. ALUM. PLATE - 1/4"x2" F.B. ANCHOR STRAPS FASTEN WITH 1/2" GALVANIZED OR ☐ INSERT ALUMINUM TRASH RACK INTO NON-CORROSIVE BOLTS & NUTS (TYP, 4 PIPE END. PLACES).

ALUMINUM TRASH RACK

NOTES:

PROVIDE MAINT. ACCESS BY WELDING (4) CROSS BARS TO (4)

VERTICAL BARS AS SHOWN. HINGE UPPER ENDS W/ FLANGES/

END. LOCATE LADDER STEPS DIRECTLY BELOW.

BOLTS & PROVIDE LOCKING MECHANISM (W/PADLOCK) ON LOWER

1. ALL STEEL PARTS MUST BE GALVANIZED & ASPHALT COATED (TREATMENT 1 OR BETTER).

2. CONTRACTOR TO VERIFY DIMENSIONS.

TRASH RACK NOT TO SCALE

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DITCH/POND 12" 12" 12" 12" 12" 12" 12" 12			
QUARRY SPALLS 6"	- QUARRY SPALLS	6"	

1. QUARRY SPALLS SHALL CONFORM TO SECTION 9-13 OF THE WSDOT STANDARD SPECIFICATIONS. MATERIALS USED FOR QUARRY SPALLS SHALL MEET THE REQUIREMENT OF SECTION 9-13.1(5) IF THE WSDOT STANDARD SPECIFICATIONS, EXCEPT THAT THE SIZE OF MATERIAL SHALL BE REVISED AS FOLLOWS: 100 PERCENT PASSING A 4-INCH SIEVE SIZE AND 40 PERCENT PASSING A 2-INCH SIEVE SIZE.

> STORM PIPE INLET/OUTLET PROTECTION DETAIL TYP NOT TO SCALE

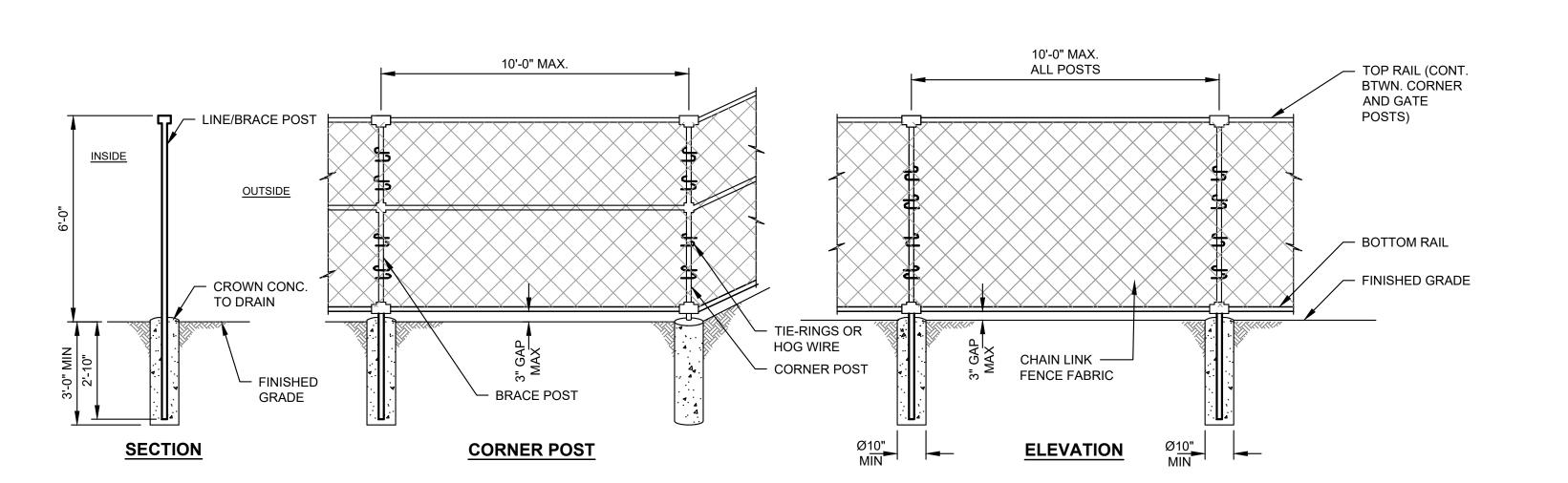
No. DATE REVISION ISSUED FOR:

PERMIT SET ISSUE DATE: JUNE 2024 APPROVED BY: CHECKED BY: SLG DRAWN BY: JPW DESIGNER: SLG G & O JOB NO.: 22260.00 DETAILS.DWG

CIVIL DETAILS

STORMWATER **DETAILS**

DRAWING: CD-6 OF: 7



Gray & Osborne, Inc. 2102 CARRIAGE DRIVE SW, **BUILDING I** OLYMPIA, WA 98502

(360) 292-7481



Reviewed for Code Compliance **Mason County Building** Department

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RESERVOIR AND **BOOSTER PUMP** STATION 1681 E McREAVY RD UNION, WA

No. DATE REVISION

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22260.00

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DESIGNER:

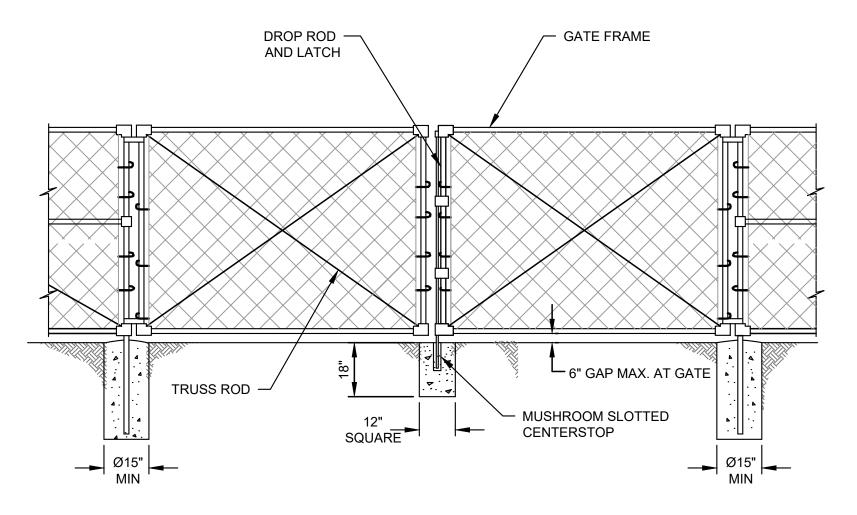
G & O JOB NO.:

FENCE DETAIL SCALE = 3\8" = 1' - 0"

1. SEE SPECIFICATIONS FOR TYPICAL MATERIAL AND INSTALLATION REQUIREMENTS.

2. INSTALL CORNER POSTS WHERE ALIGNMENT CHANGES 30° OR MORE.

3. PROVIDE GALVANIZED FINISH ON POSTS, RAILS AND FITTINGS.



NOTES:

- 1. SEE SPECIFICATIONS FOR TYPICAL MATERIAL AND INSTALLATION REQUIREMENTS.
- 2. INSTALL CORNER POSTS WHERE ALIGNMENT CHANGES 30° OR MORE.
- 3. PROVIDE GALVANIZED FINISH ON POSTS, RAILS AND FITTINGS.
- 4. PROVIDE GALVANIZED IRON, MUSHROOM TYPE, SLOTTED CENTERSTOP FOR DOUBLE GATE DROP ROD. EMBED IN 12"X12"X18" DIA. CONC. FOUNDATION.
- 5. DROP ROD FOR SWING SHALL COME EQUIPPED WITH PADLOCK LATCH.

DOUBLE SWING GATE DETAIL SCALE = 3\8" = 1' - 0"

 \sim SEE GEOLOGICAL REPORT

> **ENGINEERING SERICE REPORT DATED:**

> > **JUNE 7, 2022**

GEOLOGICAL

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FENCE AND GENERATOR PAD DETAILS

CIVIL DETAILS

DRAWING: CD-7 OF: 7



615 W. Alder St. Bldg 8, SHELTON, WA 98584

SHELTON: 360-427-9670, EXT 352

BELFAIR: 360-275-4467, EXT 352 ELMA: 360-482-5269, EXT 352 www.co.mason.wa.us

INSPECTION CARD AND CERTIFICATE OF OCCUPANCY** To schedule an inspection call or visit http://www.co.mason.wa.us/community-services/bld-inspection.php

Permit Number COM2024-00101 Date Issued 02/27/2025 Issued By 2 CONCRETE RESERVOIRS (POTABLE WATER STORAGE)

Project 1681 E MCREAVY RD Site Address Applicant **MASON CO PUD #1**

Contractor

Contractor Phone

2018 IBC, IRC, IFC, IEC, IMC, & Primary Code

UPC

Type Permit Type **NEW COMMERCIAL PERMIT** Occupancy

- -APPROVED PLANS MUST BE ONSITE FOR ALL INSPECTIONS.
- -DO NOT PROCEED BEYOND EACH STAGE OR COVER WORK UNTIL APPROVAL IS GRANTED.
- -THIS CARD MUST BE POSTED IN A CONSPICUOUS LOCATION, FRONT OF THE PREMISES IS BEST FOR MAKING ENTRY.
- -ALL PERMITS EXPIRE 180 DAYS AFTER THE PERMIT IS ISSUED OR 180 DAYS AFTER DATE OF LAST INSPECTION.
- -OWNER/AGENT IS RESPONSIBLE FOR REQUESTING ALL INSPECTIONS THROUGH FINAL INSPECTION.

THIS STRUCTURE MAY NOT BE USED OR OCCUPIED UNTIL ALL APPROVALS ARE GRANTED. PRIOR TO CALLING FOR FINAL INSPECTION, ALL CONDITIONS OF THE PERMIT MUST BE MET

Public Works	Access/Driveway	Other
Health Deptartment	Septic	Well
Planning Department	Site Inspection	
Fire Marshall	Fire Apparatus Access	Fire Sprinkler
	Auto Fire Alarm	Hood and Duct
	Other	Final
Building Department	Building Official:	Community Services Designee
Concrete	Setbacks	Slab
	Footing Perimeter	Point load Footing
	Footing Interior	Footing Decks / Porches
	Foundation Stem Walls	Other
Rough-In	Groundwork Plumbing	Framing
	Groundwork Mechanical	Plumbing
	Groundwork Gas Pipe	Mechanical
	Gas Piping	Shear Wall Nailing
	Underfloor	
	Other	
Insulation	Slab	Ceiling
	Floor	Vaulted Ceiling
	Walls	Vapor Barrier
	Other	
Wallboard Nailing	Interior Wall Brace Panels	Fire Walls
	Other	
Final B	Building	
Manufactured Home	Setbacks	Setup
	Concrete Foot / Runners	Final
	Other	



Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

COM2024-00101

NEW COMMERCIAL PERMIT

PROJECT DESCRIPTION: 2 CONCRETE RESERVOIRS (POTABLE

WATER STORAGE)

SITE ADDRESS: 1681 E MCREAVY RD UNION

ISSUED: 02/27/2025

EXPIRES: 08/26/2025

PARCEL: 321053100000

APPLICANT: MASON CO PUD #1

MANAGER

SHELTON, WA 98584

360-877-5249

OWNER: MASON CO PUD #1

MANAGER

SHELTON, WA 98584

OWNER'S REP: GRAY & OSBORNE ENGINEERING

2102 CARRIAGE ST SW SUITE 1

OLYMPIA, WA 98502 1.360.292.7481

VALUATIONS:			FEES:	<u>Paid</u>	<u>Due</u>
Project Valuation (BID, ESTIMATION)	1475000.0 0	\$1,475,000.00	Planning Commercial Review Fee	\$450.00	\$0.00
,			State Fee-Commercial	\$25.00	\$0.00
			Plan Check Fee	\$5,074.15	\$0.00
			Building Permit Fee	\$7,806.39	\$0.00
			Technology Surcharge	\$257.61	\$0.00
			Geo-Tech/ Stormwater Review	\$97.00	\$0.00
			Pre-application meeting - Major EH Plan Review	\$270.00	\$0.00

Total: \$1,475,000.0 Totals: \$13,980.15 \$0.00

REQUIRED INSPECTIONS

Setback InspectionRough- Plumbing InspectionFooting InspectionMechanical InspectionFoundation Wall-Pre-Pour InspectionInsulation InspectionSLAB INSPECTIONKNOX BOX VERIFICATION



Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

NEW COMMERCIAL PERMIT COM2024-00101

Shearwall Inspection	BLD-Final Inspection		
Framing Inspection			

CONDITIONS

- * All other necessary permits from Mason County, Washington State, Federal Agencies, and/or other agencies/groups that are required for this proposed development and construction must be obtained PRIOR TO DEVELOPMENT AND CONSTRUCTION.
- * WIND LOADS Roof coverings shall be designed and tested to withstand the maximum basic wind speed. The basic wind speed for Mason County is 85 mph with 110 mph gust factor.
- * The foundation/footing must be placed on undisturbed, firm-native soil. Proper frost depth, minimum 12 inches, shall be observed below grade in undisturbed soils.
- * CONSTRUCTION PROCESS TO BE FIELD CORRECTED AS REQUIRED PER MASON COUNTY BUILDING DEPARTMENT AND THE ADOPTED BUILDING CODE.

The construction of the permitted project is subject to inspections by the Mason County Building Department. All construction must be in conformance with the international codes as amended and adopted by Mason County. Any corrections, changes or alterations required by a Mason County Building Inspector shall be made prior to requesting additional inspections.

- * The international code requires a fire apparatus access road for every facility, building, or portion of a building that is more than 150' from an approved access road. Roads are required to meet the minimum Mason County Fire Marshal standards for Fire Apparatus Access Roads up to the point where such roads connect with a county maintained public road or to another fire apparatus access road which connects to a county maintained public road.
- * Owner / Agent is responsible to post the assigned address and/ or purchase and post private road signs in accordance with Mason County Code 14.28 and 14.17.
- * All permits expire 180 days after permit issuance, or 180 days after the last inspection activity is performed. The Building Official may grant one or more extension of 180 days, upon the receipt of a written extension request prior to permit expiration. Letter must indicate that circumstances beyond the control of the permit holder prevented action from being taken.
- * REQUIREMENTS FOR ROOF COVERINGS. Roof coverings shall be applied in accordance with the applicable provisions of the current code and the manufacturer's installation instructions.

A drip edge shall be provided at eaves and gables of shingle roofs.

- * All building permits shall have a final inspection performed and approved by Mason County Building Department prior to permit expiration. The failure to request a final inspection or to obtain approval will be documented in the legal property records on file with Mason County as being non-compliant with Mason County ordinances and building regulations.
- * Provisions for surface/subsurface drainage control must be implemented with new construction or development on site and MUST NOT adversely impact adjacent parcels. Under the requirements of Mason County Stormwater Ordinance, either private ditches and drains will meet requirements of the stormwater ordinance or prior approval will be granted to use an existing utility and drainage easement dedicated for that specific purpose. For further information regarding this ordinance contact the Mason County Public Works Department prior to construction at Ext 450
- * All construction must meet or exceed all local and state ordinances in addition to the International Codes requirements as adopted and amended by Mason County and the State of Washington. Occupancy is limited to the approved and permitted classification. Any non-approved change of use or occupancy would result in permit revocation.
- * All property lines shall be clearly identified at the time of foundation inspection.

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Mason County

Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

NEW COMMERCIAL PERMIT COM2024-00101

- * All changes to "approved" building plans that effect compliance with the international codes as amended and adopted, or any other Mason County ordinance or regulation, must be reviewed and approved by Mason County prior to construction.
- * Disclaimer: Mason County does not require a survey to obtain a building permit. As a result, site plans may not reflect accurate data. It is the applicant's responsibility to comply with setback requirements.
- * The stamped approved site plan is required to be on-site for inspection purposes. If an inspection is requested and the approved site plan is not on site, approval will not be granted. In addition, a re-inspection fee (refer to current fee schedule, minimum 1 hour) will be charged and shall be collected by the Building Department prior to any further inspections being performed or approvals granted.
- * All surface water and potential runoff must be controlled on site and shall not adversely affect any adjacent properties nor increase the velocity flow entering or abutting to any state or county culverting/ditching system or road way.
- * Approved per dimensions and setbacks on submitted site plan. Setbacks are measured from the farthest projection of the structure. Front setbacks are measured from the front lot line or road easement boundary, whichever is closer.
- * Contractor registration laws are governed under RCW 18.27 and enforced by the WA State Dept of Labor and Industries, Contractor Compliance Division. There are potential risks and monetary liabilities to the homeowner for using an unregistered contractor. Further information can be obtained at 1-800-647-0982. The person signing this condition is either the homeowner, agent for the owner or a registered contractor according to WA state law.
- * All RED stamped approved plans are required to be on-site for inspection purposes. If an inspection is called for and plans are not available on site, then approval will not be granted. In addition, a re-inspection fee (refer to current fee schedule, minimum 1 hour) will be charged and must be collected by the Building Department prior to any further inspections being performed or approvals granted.
- * The approval of this project is subject to the recommendations and specifications outlined in the attached geotechnical report or assessment. All applicable recommendations and specifications shall be applied to the development on this site. Any deviation requires stamped written approval from the registered design professional responsible for the report/assessment, and may require special inspection by same. Structures and / or land modifications (grading, cuts, fills, etc.) required in the geotechnical report / assessment, may require a separate permit. The geotechnical report / assessment shall remain attached to the approved building plans.
- * Must comply with all Washington State Department of Health Drinking Water requirements.
- * In addition to the inspections required in IBC, Section 110, the owner, the engineer or architect of record acting as the owner's agent shall employ one or more special inspectors who shall provide inspections during construction on the types of work listed under Chapter 17 and as specified by the design professional. The special inspectors duties & responsibilities shall be as specified in Chapter 17.

Special inspection reports shall be submitted to the Mason County Building Department, 615 W Alder St, Shelton WA 98584 and available for inspection. Inspection reports shall be completed and submitted to the dept. in a timely manner and shall be submitted prior to the framing and final occupancy inspections.

SOILS, CONCRETE, AND SHEAR WALLS.
GEO REPORTS SHALL ADDRESS ALL SOILS CONDITIONS PER TO CONCRETE PLACEMENT AND AS-BUILT ALL STORM WATER ELEMENTS.

* Any changes in proposed construction shall be reviewed by the engineer or architect of record and submitted in writing to the Mason County Building Department prior to construction. All engineering and/or architectural documents are a part of the approved set of plans and shall remain attached thereto. If documents are removed, approval will not be granted. In addition, a re-inspection fee (refer to current fee schedule, minimum 1 hour) will be charged and shall be collected by the Building Department prior to any further inspections being performed or approvals granted.



Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

NEW COMMERCIAL PERMIT COM2024-00101

I hereby certify that I have read and examined this application and know the same to be true and correct. All provisions of Laws and Ordinances governing this type of work will be complied with whether specified herein or not. The granting of a permit does not presume to give authority to violate or cancel the provisions of any other state/local law regulating construction or the performance of construction.			
Issued By:			
Contractor or Authorized Agent:	Date:		



615 W. Alder St. Bldg 8, SHELTON, WA 98584

SHELTON: 360-427-9670, EXT 352

BELFAIR: 360-275-4467, EXT 352 ELMA: 360-482-5269, EXT 352

www.co.mason.wa.us

INSPECTION CARD AND CERTIFICATE OF OCCUPANCY**

To schedule an inspection call or visit http://www.co.mason.wa.us/community-services/bld-inspection.php					
Permit Number Project Site Address Applicant Contractor	COM2024-00103 BOOSTER PUMP STATION 1681 E MCREAVY RD MASON CO PUD #1	Date Issued	02/27/2025	Issued By	
Primary Code Permit Type	2018 IBC, IRC, IFC, IEC, IMC, & UPC NEW COMMERCIAL PERMIT	Type Occupancy			

- -APPROVED PLANS MUST BE ONSITE FOR ALL INSPECTIONS.
- -DO NOT PROCEED BEYOND EACH STAGE OR COVER WORK UNTIL APPROVAL IS GRANTED.
- -THIS CARD MUST BE POSTED IN A CONSPICUOUS LOCATION, FRONT OF THE PREMISES IS BEST FOR MAKING ENTRY.
- -ALL PERMITS EXPIRE 180 DAYS AFTER THE PERMIT IS ISSUED OR 180 DAYS AFTER DATE OF LAST INSPECTION.
- -OWNER/AGENT IS RESPONSIBLE FOR REQUESTING ALL INSPECTIONS THROUGH FINAL INSPECTION.

THIS STRUCTURE MAY NOT BE USED OR OCCUPIED UNTIL ALL APPROVALS ARE GRANTED.
PRIOR TO CALLING FOR FINAL INSPECTION, ALL CONDITIONS OF THE PERMIT MUST BE MET

Public Works	Access/Driveway	Other
Health Deptartment	Septic	Well
Planning Department	Site Inspection	
Fire Marshall	Fire Apparatus Access	Fire Sprinkler
	Auto Fire Alarm	Hood and Duct
	Other	Final
Building Department	Building Official:	Community Services Designee
Concrete	Setbacks	Slab
	Footing Perimeter	Point load Footing
	Footing Interior	Footing Decks / Porches
	Foundation Stem Walls	Other
Rough-In	Groundwork Plumbing	Framing
	Groundwork Mechanical	Plumbing
	Groundwork Gas Pipe	Mechanical
	Gas Piping	Shear Wall Nailing
	Underfloor	
	Other	
Insulation	Slab	Ceiling
	Floor	Vaulted Ceiling
	Walls	Vapor Barrier
	Other	
Wallboard Nailing	Interior Wall Brace Panels	Fire Walls
	Other	
Final B	Building	
Manufactured Home	Setbacks	Setup
	Concrete Foot / Runners	Final
	Other	



Mason County - Division of Community Development

615 W. Alder St. Building 8 Shelton, WA 98584 360-427-9670 ext 352 www.masoncountywa.gov

COM2024-00103

NEW COMMERCIAL PERMIT

PROJECT DESCRIPTION: BOOSTER PUMP STATION

SITE ADDRESS: 1681 E MCREAVY RD UNION

ISSUED: 02/27/2025

EXPIRES: 08/26/2025

PARCEL: 321053100000

APPLICANT: MASON CO PUD #1

MANAGER

SHELTON, WA 98584

360-877-5249

OWNER: MASON CO PUD #1

MANAGER

SHELTON, WA 98584

Totals:

\$16,420.23

OWNER'S REP: GRAY & OSBORNE ENGINEERING

2102 CARRIAGE ST SW SUITE 1

Total:

OLYMPIA, WA 98502 1.360.292.7481

VALUATIONS:			FEES:	<u>Paid</u>	<u>Due</u>
Project Valuation (BID, 1475000.0 \$1,475,000.00 ESTIMATION)	1475000.0	\$1,475,000.00	State Fee-Commercial	\$25.00	\$0.00
	0		Technology Surcharge	\$257.61	\$0.00
	Plan Check Fee	\$5,074.15	\$0.00		
			Planning Commercial Review Fee	\$450.00	\$0.00
			Pre-application meeting - Major EH Plan Review	\$270.00	\$0.00
			Building Permit Fee	\$7,806.39	\$0.00
			IFC Plan Check Fee	\$2,537.08	\$0.00

REQUIRED INSPECTIONS

\$1,475,000.0

Setback InspectionMechanical InspectionFooting InspectionInsulation InspectionFoundation Wall-Pre-Pour InspectionConnection is to be verified by Health or UtilitiesShearwall InspectionKNOX BOX VERIFICATION

\$0.00



Mason County - Division of Community Development

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NEW COMMERCIAL PERMIT COM2024-00103

Framing Inspection

BLD-Final Inspection

Rough- Plumbing Inspection

CONDITIONS

* REQUIREMENTS FOR ROOF COVERINGS. Roof coverings shall be applied in accordance with the applicable provisions of the current code and the manufacturer's installation instructions.

A drip edge shall be provided at eaves and gables of shingle roofs.

* CONSTRUCTION PROCESS TO BE FIELD CORRECTED AS REQUIRED PER MASON COUNTY BUILDING DEPARTMENT AND THE ADOPTED BUILDING CODE.

The construction of the permitted project is subject to inspections by the Mason County Building Department. All construction must be in conformance with the international codes as amended and adopted by Mason County. Any corrections, changes or alterations required by a Mason County Building Inspector shall be made prior to requesting additional inspections.

- * Contractor registration laws are governed under RCW 18.27 and enforced by the WA State Dept of Labor and Industries, Contractor Compliance Division. There are potential risks and monetary liabilities to the homeowner for using an unregistered contractor. Further information can be obtained at 1-800-647-0982. The person signing this condition is either the homeowner, agent for the owner or a registered contractor according to WA state law.
- * When parcel development requires direct access to county road(s), a Road Access Permit or Approval must be granted by the Mason County Department of Public Works. For any construction which is proposed to be located within 25' of a Mason County road right of way, it is suggested to contact that office to review future planned work which may affect your project. For more information contact Public Works, at (360) 427-9670, ext. 450 or 100 W Public Works Dr. Shelton. The building permit will not be finaled until the permit holder can show proof that the access permit from Public Works has been finaled and approved.
- * All permits expire 180 days after permit issuance, or 180 days after the last inspection activity is performed. The Building Official may grant one or more extension of 180 days, upon the receipt of a written extension request prior to permit expiration. Letter must indicate that circumstances beyond the control of the permit holder prevented action from being taken.
- * All property lines shall be clearly identified at the time of foundation inspection.
- * Provisions for surface/subsurface drainage control must be implemented with new construction or development on site and MUST NOT adversely impact adjacent parcels. Under the requirements of Mason County Stormwater Ordinance, either private ditches and drains will meet requirements of the stormwater ordinance or prior approval will be granted to use an existing utility and drainage easement dedicated for that specific purpose. For further information regarding this ordinance contact the Mason County Public Works Department prior to construction at Ext 450
- * The international code requires a fire apparatus access road for every facility, building, or portion of a building that is more than 150' from an approved access road. Roads are required to meet the minimum Mason County Fire Marshal standards for Fire Apparatus Access Roads up to the point where such roads connect with a county maintained public road or to another fire apparatus access road which connects to a county maintained public road.
- * The foundation/footing must be placed on undisturbed, firm-native soil. Proper frost depth, minimum 12 inches, shall be observed below grade in undisturbed soils.
- * Owner / Agent is responsible to post the assigned address and/ or purchase and post private road signs in accordance with Mason County Code 14.28 and 14.17.
- * WIND LOADS Roof coverings shall be designed and tested to withstand the maximum basic wind speed. The basic wind speed for Mason County is 85 mph with 110 mph gust factor.



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NEW COMMERCIAL PERMIT COM2024-00103

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- * Approved per dimensions and setbacks on submitted site plan. Setbacks are measured from the farthest projection of the structure. Front setbacks are measured from the front lot line or road easement boundary, whichever is closer.
- * All surface water and potential runoff must be controlled on site and shall not adversely affect any adjacent properties nor increase the velocity flow entering or abutting to any state or county culverting/ditching system or road way.
- * Disclaimer: Mason County does not require a survey to obtain a building permit. As a result, site plans may not reflect accurate data. It is the applicant's responsibility to comply with setback requirements.
- * All construction must meet or exceed all local and state ordinances in addition to the International Codes requirements as adopted and amended by Mason County and the State of Washington. Occupancy is limited to the approved and permitted classification. Any non-approved change of use or occupancy would result in permit revocation.
- * The stamped approved site plan is required to be on-site for inspection purposes. If an inspection is requested and the approved site plan is not on site, approval will not be granted. In addition, a re-inspection fee (refer to current fee schedule, minimum 1 hour) will be charged and shall be collected by the Building Department prior to any further inspections being performed or approvals granted.
- * When parcel development requires direct access to state road(s), a Road Access Permit or Approval must be granted and approved by the Washington State Department of Transportation. For more information contact Washington State Department of Transportation, at (206)357-2620, ext. 630.
- * All other necessary permits from Mason County, Washington State, Federal Agencies, and/or other agencies/groups that are required for this proposed development and construction must be obtained PRIOR TO DEVELOPMENT AND CONSTRUCTION.
- * All RED stamped approved plans are required to be on-site for inspection purposes. If an inspection is called for and plans are not available on site, then approval will not be granted. In addition, a re-inspection fee (refer to current fee schedule, minimum 1 hour) will be charged and must be collected by the Building Department prior to any further inspections being performed or approvals granted.
- * By definition, propane tanks and heatpumps are structures, which must meet setback conditions. Please check your "Approved Site Plan" to ensure these structures meet the setback conditions listed.
- * All building permits shall have a final inspection performed and approved by Mason County Building Department prior to permit expiration. The failure to request a final inspection or to obtain approval will be documented in the legal property records on file with Mason County as being non-compliant with Mason County ordinances and building regulations.
- * SEE ALL PERMIT CONDITIONS FOR COM2024-00101. PERMIT DOCUMENTS SUBMITTED IN ONE PACKET ADDRESSING BOTH THE SILOS AND BOOSTER PUMP BUILDING.

I hereby certify that I have read and examined this application and know the same to be true and correct. All provisions of Laws and Ordinances governing this type of work will be complied with whether specified herein or not. The granting of a permit does not presume to give authority to violate or cancel the provisions of any other state/local law regulating construction or the performance of construction.			
Issued By:			
Contractor or Authorized Agent:	Date:		