



WILSON
ENGINEERING

City of Ferndale

Ferndale, Washington

Contract Documents
for the Construction of

SHOP WELL #2 WELLHOUSE PROJECT

- PART 1 – BIDDING REQUIREMENTS**
- PART 2 – CONTRACTING REQUIREMENTS**
- PART 3 – TECHNICAL SPECIFICATIONS**
- PART 4 – REFERENCE DOCUMENTS**
- PART 5 – DRAWINGS**

Wilson Project 2018-141

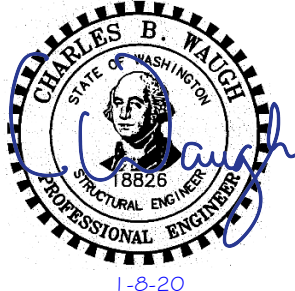
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January 8, 2020

ENGINEER'S STATEMENT

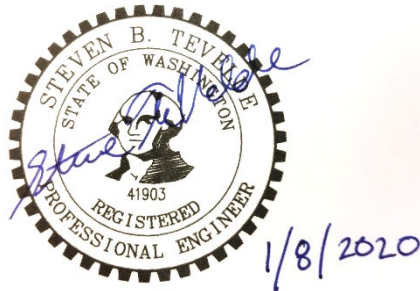
THE CONTRACT DOCUMENTS HAVE BEEN PREPARED UNDER THE DIRECTION OF THE PROFESSIONAL, REGISTERED IN THE STATE OF WASHINGTON, WHOSE SEALS AND SIGNATURES APPEAR BELOW.



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END OF SECTION

PART 1 - BIDDING REQUIREMENTS

SECTION 00 11 16 – INVITATION TO BID

ADVERTISEMENT FOR BIDS

Project Name: Ferndale Shop Well #2 – Wellhouse Project
Bid Date: January 30th, 2020 - 11:00 AM
Pre-Bid Meeting: January 23rd, 2020 – 1:00 PM

Engineer: Wilson Engineering LLC, Bellingham, WA
Engineers Estimate: \$800,000 to \$1,200,000 (including sales tax)

NOTICE TO BIDDERS: Sealed bids will be received from contractors by the Public Works Director, City of Ferndale, 2095 Main Street, P.O. Box 936, Ferndale, WA 98248 until 11:00 AM, Thursday, January 30th, 2020 for the Ferndale Shop Well #2 Building. All bids shall be received in sealed envelopes with “FERNDALE SHOP WELL #2 - WELLHOUSE” marked plainly thereon. The Project involves the proposed wellhouse construction work per contract documents. Said bids will then and there be opened and read aloud. Bidders and other properly interested parties are invited to be present at the bid opening. Bids received after the time fixed for opening cannot be considered.

Please contact either Jeff Christner or Kenna Wurden-Foster, Wilson Engineering, (360) 733-6100, for project information. Only bids from bidders who have obtained the Contract Documents and have requested to be listed on the Planholders’ List, will be accepted. Copies of plans and specifications are on file for review at the City of Ferndale Public Works Department, 2095 Main Street, Ferndale, WA 98248. Hard copies are available for purchase (\$200 non-refundable fee), or may be downloaded from the project website at <https://wilsonengineering.com/bidding-documents/>

A deposit in the form of a postal money order, cashier’s check, or bond in the amount of 5% of the greatest amount bid must be submitted with each bid proposal. Should the successful bidder fail to enter into a contract or furnish a satisfactory contract bond within the time stated in the specifications, the deposit shall be forfeited to the City.

There will be A non-mandatory, pre-bid meeting for the Project held at 1:00 PM, Thursday, January 23rd, 2020, at City Hall, 2095 Main Street, Ferndale, WA 98248. A site visit to the Ferndale Shop Well #2 site will follow the meeting.

The City shall reject any bid not accompanied by bid security. The City reserves the right to reject any or all bids if such action is in the best interest of the City. The City of Ferndale is an equal opportunity and affirmative action employer. Small, Minority and Women-owned businesses are encouraged to submit bids.

All bidders must be licensed contractors registered in the State of Washington. All work performed on this project will be subject to prevailing state wage rates. Contractor will be required to obtain a City of Ferndale business license prior to mobilization.

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

SECTION 00 21 13 – INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

It is anticipated that this project will be funded in part by the Washington State Department of Ecology. Neither the State of Washington nor any of its departments or employees are, or shall be, a party to this contract or any subcontract.

1. Bidder Qualifications

- A. Prospective Bidders shall be registered by the Washington State Department of Labor and Industries in accordance with state law.
- B. Corporations shall be registered with the State of Washington, Office of the Secretary of State.
- C. Bidders shall be regularly employed in the type of work contemplated herein.

2. Bidder's Representations

Submittal of a bid shall be deemed conclusive evidence that the bidder has:

- A. Carefully examined the proposed work site, become familiar with conditions impacting the work, and incorporated such observations into the bid.
- B. Read and understands the bidding and contract documents.
- C. Produced a bid that is without exception based on the materials, equipment and systems required by the bidding documents.
- D. Produced a bid that is made based on a complete set of Bidding Documents. The Owner is not responsible for any bidding errors resulting from the use of incomplete documents.

3. Document Interpretation

- A. The bidder shall carefully study and review the Bid Documents and promptly report any errors or omissions to the Engineer.
- B. Bidders or sub-bidders shall make any requests for clarification to the Engineer. If so directed, the Engineer may require the Bidder to submit requests in writing.
- C. Interpretations, corrections and changes to the Bidding Documents shall be made by Addendum. Interpretations, corrections and changes to the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely on them.
- D. Substitutions shall not be considered prior to the receipt of bids. The Owner is not responsible for any bidding errors resulting from the use of substitutions.

4. Addenda

- A. Addenda will be mailed, emailed, delivered or faxed to all who are known by the Engineer to have received a complete set of Bidding Documents. Copies will also be provided to the locations where plans are available for review.
- B. The Bidder shall acknowledge receipt of addenda in their bid.

5. Bidding Procedures

- A. To be considered responsive, bids shall be submitted on the enclosed form and shall be filled in by typewriter or manually in ink.
- B. The Bid form shall include the Bidder's legal name exactly as it appears on his/her registration. Form shall be signed by the individual authorized to represent the Bidder.
- C. A list of subcontractors individually accounting for more than 10-percent of the Contract Sum and the work said subcontractor will perform shall be submitted with the bid or within one hour of the published bid time.

6. Pre-Bid Meeting

- A. There will be a pre-bid meeting at date and time shown on the Invitation to Bid.
- B. Prior to attending the pre-bid meeting, bidders shall have carefully studied and compared all drawings, specifications and other instructions to identify any inconsistency or omission. Also any discrepancies between the contract documents and the physical condition of the locality shall be identified. The intent is to identify any questions or concerns regarding the proposed improvements that the bidders may have.

7. Bid Security

- A. Each Bid shall be accompanied by a Bid Security in the form of a cashier's check, certified check or surety bond equal to 5-percent of the total Bid amount. Security shall pledge that the Bidder shall enter into a contract with the Owner in accordance with the terms of the Bid Documents including furnishing payment and performance bonds.
- B. In the event a Bidder refuses to enter into such contract or fail to furnish such bonds as required, the bid security shall be forfeited to the Owner as liquidated damages.
- C. The Owner may retain bid securities submitted with the bid until such time as; (1) the contract has been executed and bonds received, (2) 30-days have elapsed, (3) all Bids have been rejected.

8. Submission of Bids

- A. Bids shall be submitted in a sealed envelope. Envelopes shall clearly show (1) the project's name and owner as it appears on the Bid Solicitation, (2) the Contractor's name and registration number, and (3) the time and date of the bid opening.
- B. Bids received after the published bid time and date will be returned unopened.
- C. Bids submitted by mail shall conform with the above requirements and be sent to City of Ferndale – City Hall, 2095 Main Street, P.O. Box 936, Ferndale, WA 98248, All bids shall be received in sealed envelopes with "FERNDALE SHOP WELL #2 BUILDING" marked plainly thereon. Bidder shall assume full responsibility for timely delivery of bid documents and the Owner is not responsible for bids received late.
- D. Oral, facsimile or telegraphic bids, modifications, or adjustments are not valid and will not receive consideration.

9. Modification or Withdrawal of Bid

- A. After the bid opening, bids shall not be withdrawn, modified or canceled by the Bidder during the stipulated time period.
- B. Bids submitted by mail prior to the bid opening may be modified or withdrawn by notice to the Owner. Such notice shall be in writing and signed by the same authorized individual signing the bid form. If such modifications or withdrawals are transmitted electronically, the original document shall be mailed and postmarked on or before the date and time of the bid opening.
- C. Withdrawn bids may be resubmitted up until the date and time of the bid opening and in accordance with these Instructions to Bidders.
- D. Bid security shall be in an amount sufficient for the bid as modified or resubmitted.

10. Opening of Bids

- A. Bids received on time will be opened and read aloud at the time and place stipulated in the Bid Solicitation. An abstract or tabulation will be made available to Bidders.
- B. Should a Bidder discover an error in his/her bid after submittal, the Bidder may request withdrawal of the bid with the following conditions:
- C. The Bidder must document the error(s) for the Owner. The Owner will review documentation and determine if the bid withdrawal and release of the Bid Security will be allowed.
- D. The Owner must receive the Bidder's intent to withdraw his/her bid submittal in writing no more than 30-hours after the bid opening (faxed notice is acceptable).
- E. The Owner alone will approve or disapprove the request for withdrawal. If approved, the Bidder will no longer be considered for Contract award and the Bid Security will be returned.
- F. If the Bidder fails to notify the Owner in accordance of an error as set forth above, and the Owner awards the Bidder the Contract, the Bidder shall either execute the Contract for the bid amount or withdraw the bid and forfeit the Bid Security.

11. Rejection of Bids

- A. The Owner reserves the right to reject any or all bids, reject a bid not accompanied by a proper bid security or other material required by the Bidding Documents, or reject a bid which is in anyway irregular or incomplete.

12. Acceptance of Bids

- A. The Owner intends to award the Contract to the lowest responsible responsive bidder whose bid submittal does not exceed available funds and conforms with the requirements described herein. The Owner shall have the right to waive informalities or irregularities in a bid submittal and to accept the bid that, in the opinion of the Owner, is in the Owner's best interest.
- B. After determination of the successful bidder based on the lowest responsible responsive bidder and other factors set forth in these instructions, the award may be made to said successful bidder on its base Bid and any combination of its additive bid items for which Owner determines funds will be available at the time of award.

- C. In evaluating whether a bidder is responsible, Owner will consider the qualifications of the bidder and many consider the qualifications and experience of subcontractors and suppliers purposed for those portions of the work for which the identity of subcontractors and suppliers must be submitted as provided in the bidding documents.

13. Contract Bond

- A. Bidders shall provide a contract bond as attached. Contract bond shall be signed by an approved surety or sureties, be in the full contract amount, and cover the faithful performance of the work described in the Contract Documents. The Contract Bond shall be in full effect until one year after Substantial Completion.

14. Contract Agreement and Award

- A. Owner's execution of the contract is contingent on the timely receipt of the Contract Bond and other submittals required by the Contract Documents.
- B. The award of the Contract, if it be awarded, shall be made within 45-days of the bid opening to the Bidder deemed by the Owner to be the lowest responsible responsive bidder.
- C. The 45-day period may be extended by mutual consent of the bidder and the Owner. If, after the 45-day period and no agreement to time extension has been made, the Contractor may withdraw his bid.
- D. The Owner reserves the right to award the bid schedules and bid alternates in any combination.

15. Execution of Contract

- A. The Bidder to whom the contract has been awarded shall sign the contract and return it and other submittals within 10 working days of the award.
- B. The Owner shall have the right to reject a contract submitted by a bidder if it is qualified by reservations or conditions stipulated by the bidder or its surety.
- C. No bid is binding on the Owner until executed by the City of Ferndale. No work shall be performed within the project site prior to the Notice to Proceed. Material or equipment orders or work undertaken away from the project site prior to contract execution shall be at the sole risk of the bidder.

16. Failure to Execute Contract

- A. If the bidder to whom award has been made fails to sign the contract and furnish satisfactory bonds within 10 calendar days of the award, or declares in writing its intent not to execute the contract, the bid security will be forfeited to the Owner and the second lowest responsible bidder will be notified of its receipt of award.
- B. If the second lowest responsible responsive bidder fails to execute the contract and furnish bonds within 20 calendar days after such notification, forfeiture of its bid security shall also be made and the third lowest responsible responsive bidder will be notified of its receipt of award, and in like manner until either (1) the contract and bond are executed by a responsible responsive bidder, (2) or further bid submittals are rejected, or (3) the number of bids submitted is exhausted.

- C. If the contract is not executed by the Contractor and Owner within the stipulated time, and it is evident that circumstances warrant an extension of time, the Owner may extend the time for executing the contract and/or bond for a period not to exceed 10 additional calendar days.

17. Return of Bid Security

- A. When bid submittals have been examined, bid securities and deposits accompanying submittals ineligible from further consideration will be returned.
- B. All other bid securities and deposits will be held until the contract has been properly executed, after which bid securities and deposits except those subject to forfeiture will be returned.

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

SECTION 00 24 13 – SCOPES OF BID

BID SCHEDULE –

CITY OF FERNDALE – FERNDALE SHOP WELL #2 WELLHOUSE PROJECT

SCOPES OF BID

This section outlines the individual bid items listed on the Bid Schedule in Section 00 41 00 - Bid Form. The descriptions are not all-inclusive, but generally indicate where costs should be allocated within the bid proposal. Descriptions represent work that shall be complete, in-place, tested, and in full operation prior to Owner's acceptance.

Each item is to be paid on a lump sum or unit price basis and shall include furnishing all necessary planning, labor, equipment, materials, and supplies required to furnish, install and test the improvements covered under the item. Each item shall include, as applicable, work shown on the plans including all excavations, back-fill, back-fill materials, compaction, pavement removal, disposal of waste material at contractor's site, locating and protecting existing utilities and services, base and top course, paving, trenching, imported backfill, pipe bedding, cleaning, testing, surface restoration and landscaping. The scope of each bid item is outlined below. It is not intended to include all of the appurtenances of an item in the description. See appropriate Specification or WSDOT Standard Specifications and as shown on the Drawings for a more complete representation of the work. It is the responsibility of the Bidders to include all costs for the completed project in the bid items listed.

BASE BID ITEM

1. Wellhouse Project, Lump Sum

- A. Measurement for payment for individual items of Shop Well #2 Project will be based upon the unit values listed in the Schedule of Values submitted by the CONTRACTOR and reviewed and approved by the Engineer.
- B. Payment for the Shop Well #2 Project will be made at the Lump Sum Price shown on PROPOSAL for Bid Item 1, which will constitute full compensation for all WORK as described in the Contract Documents.

UNIT QUANTITY BID ITEMS

2. Trench Safety System, Lump Sum (LS)

This work consists of installing trench safety excavation provisions in accordance with WSDOT, OSHA, and other applicable rules and regulations.

3. Bollards, price based on Each (EA)

Construction of bollards (at site locations chosen by the Owner) shall be considered unit quantity work which the Contractor shall be compensated for as described below.

- A. Measurement for payment for bollards will be based on the actual quantity, each, of finished bollards.
- B. Payment for bollards, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications.

4. Preparation of SWPPP, Lump Sum (LS)

This includes all costs associated with determining, developing, preparing, and submitting a Stormwater Pollution Prevention Plan (SWPPP). SWPPP to be prepared in accordance with Section 31 32 11 – Soil Surface Erosion Control and TESC Plans and Notes. Measurement and partial payments will be based on approximate percentage of completion of SWPPP.

5. Maintenance Work for SWPPP, Lump Sum (LS)

This Includes all costs associated with implementing, adjusting, inspections, reporting, responding to precipitation events, and maintaining effective erosion and sediment control measures for the WWTP Upgrade throughout the life of the project in accordance with the Stormwater Pollution Prevention Plan and the NPDES permit, including quarry spall construction entrance, siltation ponds, silt fencing, straw, and other sediment trapping devices; slope stabilization measures; low-impact construction practices; and project sequencing. Work also includes updating the SWPPP and keeping a current version available on-site at all times for reference. Measurement and partial payments will be based on approximate percentage of completion of the WWTP Upgrade.

6. City SCADA/PLC Programmer Services, Force Account (FA)

A. Measurement for payment for City SCADA/PLC Programmer Services by TSI (contact: Mitch Stewart, phone: 425-320-7632) will be based on the actual force account total of finished City SCADA/PLC Programmer Services work for Bid Items for startup and testing of the complete system (including all PLC, Operator Interface, and SCADA System programming) as directed by City Staff and per Contract Documents. Force account work to be per WSDOT Standard Specifications, Section 1-09.6. An outline of the anticipated services is provided in PART 4 - Reference Documents.

B. Payment for Programming will be made at the total sum of the actual force account, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications, including 2020 WSDOT requirements.

EXTRA WORK ITEMS

7. Structural Concrete, price based on cubic yards (CY)

A. Measurement for payment for extra structural concrete (poured in place structural concrete with reinforcing similar to the grit basin walls as directed by the Engineer) will be based on the actual quantity, cubic yards, of finished extra structural concrete.

B. Payment for extra structural concrete, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications.

8. Over Excavation, price based on cubic yards (CY)

A. Measurement for payment for over excavation (over excavation due to poor subsurface soil conditions), as directed by the Engineer, will be based on the actual quantity, cubic yards, of finished over excavation. Over excavated material is to be hauled off-site and disposed of at a certified disposal site per specifications.

B. Payment for over excavation, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications

9. Crushed Surfacing Top Course, price based on Tons (TN)

- A. Measurement for payment for extra crushed surfacing top course, as directed by the Engineer, will be based on the actual quantity, tons, of finished material. Includes all costs associated with providing, spreading, and compacting Crushed Surfacing Top Course per WSDOT Section 9-03.9(3) Crushed Surfacing Top Course, minimum density 95%.
- B. Payment for extra crushed surfacing top course, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications

10. Crushed Surfacing Base Course, price based on Tons (TN)

- A. Measurement for payment for extra crushed surfacing base course, as directed by the Engineer, will be based on the actual quantity, tons, of finished material. Includes all costs associated with providing, spreading, and compacting Crushed Surfacing Base Course per WSDOT Section 9-03.9(3) Crushed Surfacing Base Course, minimum density 95%.
- B. Payment for extra crushed surfacing base course, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications.

11. Gravel Base, price based on Tons (TN)

- A. Measurement for payment for extra gravel base, as directed by the Engineer, will be based on the actual quantity, tons, of finished material. Includes all costs associated with providing, spreading, and compacting Gravel Base per WSDOT Section 9-03.10 Gravel Base, minimum density 95%.
- B. Payment for extra gravel base, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications.

12. Quarry Spalls, price based on Tons (TN)

- A. Measurement for payment for extra quarry spalls, as directed by the Engineer, will be based on the actual quantity, tons, of finished material. Includes all costs associated with providing, spreading, and compacting Quarry Spalls per WSDOT Section 9-13.1(5) Quarry Spalls, minimum density 95%.
- B. Payment for extra quarry spalls, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications.

13. HMA Cl. ½" PG58H-22, price based on Tons (TN)

- C. Measurement for payment for extra hot mix asphalt, as directed by the Engineer, will be based on the actual quantity, tons, of finished material. Includes all costs associated with preparing pavement area, providing, spreading, compacting, testing, seam sealing, and tack coating two 2" thick lifts (4" total thickness) of Hot Mix Asphalt pavement with ½" aggregate per WSDOT standards Section 5-04, minimum density 90%.

- D. Payment for extra hot mix asphalt, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications.

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

SECTION 00 31 13 – PRELIMINARY PROJECT PHASES

The following Preliminary Project Phasing Plan is provided for planning purposes. This phasing plan is not meant to dictate means and methods to perspective Bidders or take the place any required planning on the part of the Bidder to provide a responsive Bid. This phasing plan is simply an outline of the work to be performed that takes into the account the lead-time and critical path nature of the submittals, ordering, and delivery of the project equipment.

Preliminary Project Phasing Plan

- A. Phase 1 – Work Summary (January 2020 to May 2020)
 - 1. Open Bids: January 29, 2020
 - 2. Notice of Award: Early February 2020
 - 3. Preconstruction Meeting: February 2020
 - 4. Construction Submittals: February 2020
 - 5. Mobilize on-site: Late February 2020
 - 6. Establish Erosion Control Measures: Early March 2020
 - 7. Construct Wellhouse Improvements (Building, retaining wall, piping, etc.)
 - 8. During construction, coordinate with City and construct well base, sole plate, surface plate, elbow, and piping. Carefully configure and size everything so both the temporary pump (30 HP pump assembly) and the permanent pump (200 HP pump assembly) can be installed inside the same well base structure.
 - 9. Remove existing 10 HP well pump assembly and install temporary 30 HP well pump, motor, 4” drop pipe, and accessories. However, Contractor to confirm that everything is configured so that the permanent submersible well pump (Owner furnished and owner installed 200 HP well pump/motor assembly) can be easily installed, connected, and tested prior to summer 2021.
 - 10. Phase 1 Completion Deadline (place temporary well pump in service): May 29, 2020
- B. Phase 2 – Work Summary (May 2020 to July 2020)
 - 1. Complete construction work, as needed, for permanent generator set.
 - 2. Finish remaining site work and permanent fencing/gate installation
 - 3. Provide HMA paving as specified.
 - 4. Final Clean-Up, Painting, Labeling, Etc.
 - 5. Substantial Completion Deadline: July 31, 2020

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

SECTION 00 31 32 – GEOTECHNICAL DATA

The following geotechnical information is available for the project site:

Geotechnical Letter-Report
Ferndale Shop Well #2
Ferndale, Washington
for Wilson Engineering, LLC
Prepared by Associated Earth Sciences, Inc. (AESI)
February 5, 2019

A copy of this report is included in PART 4 – REFERENCE DOCUMENTS.

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

SECTION 00 41 00 – BID PROPOSAL

Name of Bidder: _____

To: City of Ferndale
2095 Main Street
Ferndale, Washington 98248

Project: Ferndale Shop Well #2 Building

BASE BID – Well Building

ITEM		APPROX. QTY	UNIT	UNIT PRICE	AMOUNT
1	Wellhouse Project	1	LS		
	BASE BID ITEM 1				

UNIT QUANTITY BID ITEMS

ITEM		APPROX. QTY	UNIT	UNIT PRICE	AMOUNT
2	Trench Safety System	1	LS		
3	Bollards	4	EA		
4	Preparation of SWPPP	1	LS		
5	Maintenance Work for SWPPP	1	LS		
6	City SCADA/PLC Programmer Services	1	FA	\$72,000.00	\$72,000.00
	SUBTOTAL UNIT QUANTITY BID ITEMS 2-6				

EXTRA WORK ITEMS

ITEM		APPROX. QTY	UNIT	UNIT PRICE	AMOUNT
7	Structural Concrete	10	CY		
8	Over Excavation	20	CY		
9	Crushed Surfacing Top Course	20	TN		
10	Crushed Surfacing Base Course	20	TN		
11	Gravel Base	20	TN		
12	Quarry Spalls	20	TN		
13	Hot Mix Asphalt	20	TN		
	SUBTOTAL EXTRA WORK ITEMS 7-13				

	SUBTOTAL ITEMS 1-13		\$
	8.7% SALES TAX (City of Ferndale)		\$
	TOTAL BID		\$

LIST OF MANUFACTURERS

The named manufacturers for some equipment items are listed below. Contractor is to circle their selected manufacturer, when a choice is available. Contractor's Base Bid Item #1 – Wellhouse Project is to be based on the following:

Equipment

Base Bid Manufacturer

A. Temporary Well Pump

Grundfos

B. Generator

Cummins Onan, Caterpillar

EQUIPMENT ALTERNATES:

Contractors may submit an approval package for equipment of alternate manufacturers to the base bid manufacturer for review with their bid and included as an Equipment Alternate on this Bid Proposal. A pre-approval review prior to bid will not be done. Contractors proposing alternate manufacturers will be responsible for all costs associated with system evaluation and redesign including all electrical, mechanical, and civil aspects of the installation.

A. Furnish Temporary Well Pump Equipment other than specified.

Lump Sum Deduction \$ - Deduction _____

Amount in Words: _____

Manufacturer & Model No. _____

B. Furnish Generator Equipment other than specified.

Lump Sum Deduction \$ - Deduction _____

Amount in Words: _____

Manufacturer & Model No. _____

Note 1: Mobilization items and partial payments for Mobilization shall be in accordance with WSDOT Standard Specifications Section 1-09.7.

Note 2: See Section 00 24 13 –Scopes of Bids for more description of each bid item.

Note 3: Payments will be made for actual quantities of bid items installed on the project. Estimated contract quantities provide contingencies with respect to rock and miscellaneous alignment adjustments; and to establish a not-to-exceed level of construction cost for Owner's planning purposes. If required by actual field conditions, bidders should be prepared to perform all expected and contingency work reflected in the estimated contract quantities and in the quantity ranges identified for additive and deductive unit prices. Bidders should not, however, expect to be paid the total contract price if the contingency quantities are not required to be installed by actual field conditions.

The Owner reserves the right to accept or reject any or all bid prices within sixty (60) days of the bid date.

Time for Completion

See Supplementary Condition 15 - Completion Date for completion time requirements.

Liquidated Damages

The undersigned agrees to pay the Owner as liquidated damages the sum as specified in the General Conditions for each consecutive calendar day that is in default after the Contract Time. Liquidated damages shall be deducted from the contract by change order or from the Contractor's application for payment as determined by Owner in its sole discretion.

Contractor is required to pay Washington State Prevailing Wages and Federal Prevailing Wages. All work performed on this project will be subject to the higher of the prevailing state or federal wage rates.

Receipt of Addenda

Receipt of the following addenda is acknowledged:

Addendum No. ____	Addendum No. ____	Addendum No. ____
Addendum No. ____	Addendum No. ____	Addendum No. ____

Name of Firm _____

NOTE: *If bidder is a corporation, write State of Incorporation; if a partnership, give full names and addresses of all parties below.*

Non-Collusion Declaration: By signing below, I hereby declare that I, firm, association or corporation has (have) not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action restraining free competitive bidding for this project.

Signed by _____, Official Capacity _____

Print Name _____

Address _____

City _____ State _____ Zip Code _____

Date _____ Telephone _____ FAX _____

State of Washington Contractor's License No. _____

Federal Tax ID # _____ e-mail address: _____

Employment Security Department No. _____

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

SECTION 00 43 13 – BID BOND FORM

Deposit Statement

Herewith find a deposit in the form of certified check, or cashier's check, in the amount of
Five percent (5%) of maximum amount bid (Total for all Bid Items + sales tax) in the attached Proposal.

Bid Bond

KNOW ALL PEOPLE BY THESE PRESENTS, that _____ the
CONTRACTOR, hereinafter known as PRINCIPAL, and _____ hereinafter
known as SURETY, are held and firmly bound to the City of Ferndale hereinafter known as
OWNER, in the penal sum of _____

_____ dollars (not less than 5% of Base Bid plus Additive Alternates including Washington State Sales Tax) for the
payment of which sum well and truly to be made, we do jointly and severally bind ourselves, our heirs, executors,
administrators, successors and assigns firmly by these presents.

WHEREAS, the PRINCIPAL has submitted a bid for

(Project Title): _____

NOW, THEREFORE, the condition of this obligation is such that if the OWNER accepts the bid of the
PRINCIPAL, and

- a. the PRINCIPAL executes such contract documents required by the terms of the bid and provides required
Bonds for the performance of the contract and for the prompt payment of labor and material furnished for
the project as may be specified in the bid then this obligation is satisfied, or
- b. in the event of the failure of the PRINCIPAL to execute such contract documents and provide such Bonds
required by the terms of the bid, the PRINCIPAL shall pay and forfeit to the OWNER the full penal sum
hereof, then this obligation shall be null and void; otherwise this obligation remains in full force and effect
and the SURETY shall forthwith pay and forfeit to the OWNER, as a penalty and liquidated damages, the
amount of this bond.

SIGNED, SEALED AND DATED THIS _____ day of _____, 20____.

PRINCIPAL

SURETY

By

By

Title

Title

Address of PRINCIPAL

Address of SURETY

Note: If PRINCIPAL is Partnership, all Partners should execute bond. Surety companies executing bonds must
appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to
transact business in the State of Washington. A power of attorney must be provided which appoints the
SURETY's true and lawful attorney-in-fact to make, execute, seal and deliver this bond.

*** END OF SECTION ***

SECTION 00 43 93 – BID SUBMITTAL CHECKLIST

The bidder is advised to use the following list to assemble all forms required to be submitted with their bids. In accordance with RCW 39.30.060, bidders shall submit the required documentation listed below.

Bid must be received prior to **11:00 A.M. PST, Wednesday, January 29, 2020.**

Bid Submittal Checklist

Part 1 – (to be submitted with the bid)

- _____ Bid Proposal (Section 00 41 00 BID PROPOSAL)
- _____ Bid Guarantee (Section 00 43 13 BID BOND or other type of Bid Guarantee)
- _____ Contractors Qualifications (Section 00 45 13)
- _____ Non-Collusion Affidavit (Section 00 45 19)
- _____ Certification of Compliance with Wage Payment Statutes (Section 00 45 29)

Part 2 – (to be submitted either with the bid or within 1-hour of the bid)

- _____ List of Subcontractors (Section 00 45 33)
- _____ Subcontractors Qualifications (Section 00 45 43)

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

SECTION 00 45 13 - CONTRACTORS QUALIFICATIONS

CONTRACTORS QUALIFICATIONS

The below listed reference information shall be submitted with the Bid.

Bidder to list three previous drinking water well building projects with similar value (\$800,000+) completed by Bidder as prime contractor. Bidder shall have successfully completed with their own equipment and personnel a minimum of three similar projects in the last six years to be considered qualified.

1. Project: _____
(Name and Location)
Contract Amount: _____

Reference: _____
(Company Name, Contact & Telephone)
2. Project: _____
(Name and Location)
Contract Amount: _____

Reference: _____
(Company Name, Contact & Telephone)
3. Project: _____
(Name and Location)
Contract Amount: _____

Reference: _____
(Company Name, Contact & Telephone)

Bidder shall provide the following information.

1. Resume of superintendent proposed for project.
2. List and provide references (Owner and Engineer) for any project within the last three years which have involved disputes for which the Contractor filed a claim resulting in formal dispute resolution, third-party mediation or arbitration, or a lawsuit.
3. List and provide references (Owner and Engineer) for all public works contracts in which the Contractor was sued by the Owner.

*** END OF SECTION ***

SECTION 00 45 19 – NON-COLLUSION AFFIDAVIT

NON-COLLUSION AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF WHATCOM)

The undersigned, being duly sworn, deposes and says that the person, firm, association, co-partnership or corporation herein named, has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in the restraining of free competitive bidding in the preparation and submission of a proposal to the City of Ferndale for consideration in the award of a contract on the improvement named above.

Contractor

Subscribed and sworn to before me this ____ day of _____, 20__.

Notary Public in and for the
State of Washington, residing at

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

SECTION 00 45 29 – CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES

The bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date (January 8, 2020), the bidder is not a “willful” violator, as defined in RCW 49.48.082, of any provision of chapters 49.46, 49.48, or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction.

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

Bidder’s Business Name

Signature of Authorized Official*

Printed Name

Title

Date

City

State or country

Check One:

Sole Proprietorship ☐ Partnership ☐ Joint Venture ☐ Corporation ☐

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

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

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

END OF SECTION

SECTION 00 45 33 – LIST OF SUBCONTRACTORS - BIDS ON PUBLIC WORKS - IDENTIFICATION, SUBSTITUTION OF SUBCONTRACTORS

The prime contractor shall submit as part of the bid, or within one hour after the published bid submittal time, the names of the subcontractors with whom the bidder, if awarded the contract, will subcontract for performance of the work of: HVAC (heating, ventilation, and air conditioning); plumbing; and electrical, or to name itself for the work. The prime contract bidder shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the prime contract bidder must indicate which subcontractor will be used for which alternate. Failure of the prime contract bidder to submit as part of the bid the names of such subcontractors or to name itself to perform such work or the naming of two or more subcontractors to perform the same work shall render the prime contract bidder's bid nonresponsive and, therefore, void.

HVAC Subcontractor: _____

Address: _____ **Phone:** _____

Plumbing Subcontractor: _____

Address: _____ **Phone:** _____

Electrical Subcontractor: _____

Address: _____ **Phone:** _____

Contractor shall also provide a list of all subcontractors whose work exceeds ten (10) percent of the bid and the name of the Control System Integrator. Additional sheets may be used if necessary. This combined subcontractor list must be submitted with the bid OR within one-hour of the bid as described in Section 00 43 93 – BID SUBMITTAL CHECKLIST.

Control System Integrator:

Name: _____

Address: _____

Telephone Number: _____

Portion of Work: _____

City SCADA/PLC Programmer:

Name: Technical Systems Incorporated (TSI)

Address: 2303 196th Street SW, Lynnwood, WA 98036

Telephone Number: 425-320-7632, contact: Mitch Stewart

Portion of Work: Services as defined in Part 4 – Appendix F

Subcontractors performing more than 10% of the bid price:

Name: _____

Address: _____

Telephone Number: _____

Portion of Work: _____

Name: _____

Address: _____

Telephone Number: _____

Portion of Work: _____

Name: _____

Address: _____

Telephone Number: _____

Portion of Work: _____

Name: _____

Address: _____

Telephone Number: _____

Portion of Work: _____

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

SECTION 00 45 43 – SUBCONTRACTOR QUALIFICATIONS

The below listed reference information will be required 1 hour after the bid opening for all listed subcontractors of the apparent low bidder. The information may also be asked of the subcontractors of the next two low bidders at that time.

Bidder to list the following information for **three** projects for **each** of the subcontractors listed in Section 00 45 33 LIST OF SUBCONTRACTORS (except for the City PLC/SCADA Programmer). The selected projects must be of equivalent size and scope to the portion of work the subcontractor will complete on the **Ferndale Shop Well #2 Wellhouse Project**, and the subcontractor must have completed the work using his/her own personnel and equipment.

(This sheet shall be duplicated for each Subcontractor)

Name of Subcontractor: _____

1. Project: _____
(Name and Location)

Contract Amount: _____

Reference: _____
(Company Name, Contact & Telephone)

2. Project: _____
(Name and Location)

Contract Amount: _____

Reference: _____
(Company Name, Contact & Telephone)

3. Project: _____
(Name and Location)

Contract Amount: _____

Reference: _____
(Company Name, Contact & Telephone)

*** END OF SECTION ***

PART 2

CONTRACTING REQUIREMENTS

SECTION 00 51 00 – NOTICE OF AWARD

NOTICE OF AWARD

To: _____

For: City of Ferndale
Shop Well #2 Wellhouse Project

The Owner has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids and Information for Bidders.

You are hereby notified that your BID has been ACCEPTED in accordance with your proposal for the amount of \$_____.

You are required by the Information for Bidders to execute the Contract and furnish the required Bond(s) and certificates of insurance within ten (10) calendar days from the date of this Notice of Award.

If you fail to execute said Contract and furnish said Bond(s) within ten (10) working days from the date of this Notice, the City will be entitled to consider all your rights arising out of the City's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the City within 3 days of its receipt.

Dated this _____ day of _____ 20__

City of Ferndale
Owner

By _____
Title _____

=====

ACCEPTANCE OF NOTICE:

Receipt of this NOTICE OF AWARD is hereby acknowledged:

By _____.

Dated this _____ day of _____, 20__

By _____

Printed Name: _____

END OF SECTION

SECTION 00 52 00 – AGREEMENT FORM

THIS AGREEMENT is made and entered into at Ferndale, Washington, this _____ day of _____, 2019, by and between City of Ferndale, hereinafter designated as the OWNER, and _____ hereinafter designated as the CONTRACTOR.

It is made with reference to the following facts:

1. OWNER has heretofore caused to be prepared certain Contract Documents including Bidding Requirements, Contracting Requirements, Technical Specifications, Miscellaneous Documents and Plans for the construction of the **Ferndale Shop Well #2 Wellhouse Project**.
2. CONTRACTOR filed with the OWNER on _____, 20__, a proposal to complete said work.
3. Contractor agreed to accept as payment therefor the sum fully stated and set forth in the Proposal.
4. The Contract Documents fully and accurately describe the terms and conditions upon which the CONTRACTOR proposed to furnish said equipment, labor, material and appurtenances and perform said work, together with the manner and time of furnishing same.
5. Third-Party Beneficiary: The State of Washington shall be, and is hereby, named as an express third-party beneficiary of this contract, with full rights as such.

IT IS THEREFORE AGREED, first, that a copy of said Contract Documents as aforesaid, does in all particulars become a part of the Agreement by and between the parties hereto in all matters and things therein set forth and described; and further, that the OWNER and CONTRACTOR hereby accept and agree to the terms and conditions of said Contract Documents as filed completely as if said terms and conditions and plans were herein set out in full.

This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in triplicate each of which shall be deemed an original on the day first above written.

OWNER: CITY OF FERNDALE

By: _____

Name: _____

Title: _____

(SEAL)

ATTEST:

Name: _____

TITLE: _____

APPROVED AS TO FORM:

By: _____

Name: _____

Dated: _____

CONTRACTOR _____

By: _____

Name: _____

Title: _____

(SEAL)

ATTEST:

Name: _____

Title: _____

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

SECTION 00 55 00 – NOTICE TO PROCEED

NOTICE TO PROCEED

DATE _____
CONTACT _____
CONTRACTOR _____
ADDRESS _____
ADDRESS _____

RE: Notice to Proceed
Ferndale Shop Well #2 Wellhouse Project
City Project No.

Dear CONTACT:

The City of Ferndale has reviewed and approved the contract bond and evidence of insurance for the aforementioned Project. Therefore, the contract has been executed.

This notice shall constitute the Notice to Proceed on the above referenced project. Contract time (___ working days) will begin on DATE. The date of completion of all work is _____.

If you have comments, questions, or require further information, please do not hesitate to contact me at (360) 384-4607.

Sincerely,

CITY OF FERNDALE

Mike Olinger
Project Manager

CC. file

END OF SECTION

SECTION 00 61 13 – PERFORMANCE AND PAYMENT BOND FORMS

PERFORMANCE BOND to the City of Ferndale

KNOW ALL PEOPLE BY THESE PRESENTS, That we _____
_____ the Contractor named in the Contract hereinafter referred
to as PRINCIPAL, and _____ as SURETY, are jointly and severally held
and firmly bound to the City of Ferndale, hereinafter referred to as OWNER named in said Contract Shop Well #2
Wellhouse Project, Ferndale, Washington, for the penal sum of,

DOLLARS (\$ _____),
lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our
heirs, assigns, administrators and successors jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that Whereas, the Principal entered into a contract with
the Owner, dated the _____ day of _____, 20____, for such construction work with the City of Ferndale,
Washington.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform all of the provisions and fulfill all of
the undertakings, covenants, terms, conditions and agreements of said contract during the period of the original
contract and any extensions thereof that may be granted by the Owner, with or without notices to the surety; and
during the life of any guaranty required under the contract; and shall also well and truly perform and fulfill all of the
undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said
contract that may hereafter be made; notice of which modifications to the surety being hereby waived, shall
indemnify and save harmless owner from all cost and damage by reason of the principal's default of failure to do so,
and shall pay the State of Washington sales and use taxes, and amounts due said state pursuant to Titles 50 and 51 of
the Revised Code of Washington then this obligation to be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above bonded parties have executed this instrument under their separate seals this
_____ day of _____, 20____, the name and corporate seal of each corporate party hereto affixed, and these
presents duly signed by its undersigned representatives pursuant to authority of its governing body.

Corporate Seal:

PRINCIPAL

ATTEST: (If Corporation)

By: _____

Title: _____

Corporate Seal:

SURETY

By: _____

Title: _____

PAYMENT BOND
to the City of Ferndale

KNOW ALL PEOPLE BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____, hereinafter called Principal,
(Corporation, Partnership or Individual)

and _____
(Name of Surety)

(Address of surety)

hereinafter called **SURETY**, are held and firmly bound unto _____

(Name of Owner)

(Address of Owner)

hereinafter called **OWNER**, in the penal sum of _____ Dollars, \$(_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the **OWNER**, dated the _____ day of _____ 20____, a copy of which is hereto attached and made a part hereof for the construction of:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, **SUBCONTRACTORS**, and corporations furnishing materials for or performing labor in the prosecution of the **WORK** provided for in such contract, and any authorized extension or modification thereof including all amounts due for materials, lubricants, oil, gasoline, coal, and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such **WORK**, and all Insurance premiums on said **WORK**, and for all labor, performed in such **WORK** whether by **SUBCONTRACTOR** or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PAYMENT BOND (cont.)

PROVIDED, FURTHER, that the said **SURETY** for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the **WORK** to be performed thereunder or the **SPECIFICATIONS** accompanying the same shall in any wise affect its obligation on this **BOND**, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the **WORK** or to the **SPECIFICATIONS**.

PROVIDED, FURTHER, that no final settlement between the **OWNER** and the **CONTRACTOR** shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which
(number)

shall be deemed an original, this the _____ day of _____

ATTEST:

Principal

(Principal) Secretary

(SEAL) By _____(s)

(Address)

Witness as to Principal

(Address)

(Surety)

ATTEST: By _____
(Attorney –in-Fact)

Witness as to Surety

(Address)

(Address)

NOTE: Date of **BOND** must not be prior to date of Contract.

If **CONTRACTOR** is Partnership, all partners should execute **BOND**.

IMPORTANT: Surety companies executing **BONDS** must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the **PROJECT** is locate

*** END OF SECTION ***

SECTION 00 61 23 – RETAINAGE BOND FORM

CITY OF FERNDALE RETAINAGE INVESTMENT OPTION

CONTRACTOR: _____

PROJECT NAME: _____

DATE: _____

Pursuant to Chapter 60.28 RCW, you may choose how your retainage under this contract will be held and invested. Please complete and sign this form indicating your preference. If you fail to do so, the City of Ferndale (City) will hold your retainage as described in "Current Expense", option 1 below.

- _____ 1. Current Expense: The City will retain your money in its Current Expense Fund Account until thirty days following final acceptance of the improvement or work as completed. You will not receive interest earned on this money.
- _____ 2. Interest Bearing Account: The City will deposit retainage checks in an interest-bearing account in a bank, mutual savings bank, or savings and loan association, not subject to withdrawal until after the final acceptance of the improvement or work as completed or until agreed to by both parties. Interest on the account will be paid to you.

BONDS AND SECURITIES ACCEPTABLE BY THE CITY OF FERNDALE:

1. Bills, certificates, notes or bonds of the United States.
2. Other obligations of the United States or its agencies.
3. Indebtedness of the Federal national Mortgage Association.
4. Time Deposits in commercial banks.

Designate below the type of investment selected:

- _____ 3. Bond-in-Lieu: With the consent of the City, the contractor may submit a bond for all or any portion of the amount of funds retained by the City in a form acceptable to the City and from a bonding company meeting standards established by the City, if any. Unless otherwise indicated, the contractor elects to submit a bond for the entire 5% retainage amount. Such bond and any proceeds there from shall be made subject to all claims and liens and in the same manner and priority as set forth for retained percentages in Chapter 60.28 RCW. Whenever the City accepts a bond-in-lieu of retained funds from a contractor, the contractor shall accept like bonds from any subcontractors or suppliers from which the contractor has retained funds. The contractor shall then release the funds retained from the subcontractor or supplier, to the subcontractor or supplier, within thirty days of the contractor's receipt of the retained funds from the City.

Retainage is normally released 30 - 45 days after final acceptance of work by the City, or following receipt Employment Security / Department of Revenue clearance, whichever takes longer.

(Contractor's Signature) Date

Title: _____

*** END OF SECTION ***

SECTION 00 73 00 – SUPPLEMENTARY CONDITIONS

SUPPLEMENTAL CONDITIONS

The following supplementary conditions modify WSDOT Standard Specifications. If there are any conflicts between these Supplemental Conditions and the Standard Specifications, these Supplemental Conditions shall take precedence.

1. DOCUMENTS INCORPORATED BY REFERENCE

The following documents are incorporated by reference, to include, but not be limited to:

- Specifications
- Proposal
- Drawings
- Contract
- WSDOT Standard Specifications Plans for Road, Bridge and Municipal Construction, 2020 Edition and Standard Plans for Road, Bridge and Municipal Construction, 2020 Edition

2. CONFLICT AND PRECEDENCE

In the event of any conflicting provisions or requirements between the component parts of the Contract Documents, the component parts shall take precedence in the following order:

1. Change Orders
2. Contract Form
3. Addenda
4. Permits and requirements from governmental agencies
5. Drawings
6. Supplemental Conditions
7. Technical Specifications
8. Ferndale City Standards
9. WSDOT Standard Drawings & Details
10. WSDOT Standard Specifications

3. CONTRACT PLANS AND SPECIFICATIONS

Five (5) sets of Contract Documents, three (3) sets of 11"x 17" plans, two (2) sets of 24"x 36" plans, and a CD with Contract Documents and plans in PDF will be furnished to the Contractor free of charge. Additional sets may be purchased at the advertised price per set.

4. EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF WORK

The bidder shall carefully examine the proposed work site (including material sites), and the contract documents. Submittal of a bid shall be conclusive evidence that the bidder has made these examinations and understands all requirements for the performance of the completed work.

The Contractor shall make deductions and conclusions as to the nature of the materials to be excavated, the difficulties which may arise from subsurface conditions, and of doing any other work affected by the subsurface conditions and shall accept full responsibility. The accuracy of information furnished by the Owner and/or Engineer and/or the plans and specifications as to underground structures, foundation conditions, character of soil, position and quantity of surface and ground water, etc., is not guaranteed. Bidders must satisfy themselves by personal examination and by such other means as they desire with respect to actual conditions in regard to existing groundwater or surface structures. Unforeseen conditions shall not constitute a claim for additional payment under the terms of the contract or constitute a basis for cancellation thereof.

The Specifications do not necessarily discuss complete details of construction, work or materials, performance or installation, and do not necessarily cover construction details or other items of work or fixtures of equipment may affect any installation. These details must be ascertained by the Contractor and correlated to bring the parts together to a completed whole.

Where alternate methods have not been brought to the Owner's attention, it is assumed that the Contractor has figured the costlier method or methods.

5. WORK AND MATERIALS

In addition to the requirements stated in this contract document, the following shall apply:

All work and materials under this contract shall conform to the 2018 Edition of *Standard Specifications for Road, Bridge and Municipal Construction* as prepared by Washington State Department of Transportation (WSDOT) and Washington State Chapter of American Public Works Association (APWA), and according to the instructions and recommendations of the manufacturer of the material concerned. In case of a conflict between any of the above referenced Standards, the more stringent shall apply.

References throughout the above-mentioned Standard Specifications to "State" or "Owner" shall refer to the City of Ferndale.

6. OMISSIONS AND DISCREPANCIES

Upon receipt of Award of Contract, the Contractor shall carefully study and compare all drawings, specifications and other instructions and shall, prior to ordering material or performing work, report in writing to the Owner any error, inconsistency or omission not discovered at the pre-bid meeting. If during the accomplishment of the work, a discrepancy is found between the drawings and the physical condition of the locality, it shall be the Contractor's duty to inform the Owner in writing, and the Owner shall promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

Minor items of work or material omitted from the original plans or specifications, but clearly inferable from the information presented and which are called for by accepted good practice, shall be provided and/or performed by the Contractor as part of the original bid.

7. SURVEYS, PERMITS, REGULATIONS

The Engineer shall provide construction staking for the project. The Contractor shall provide a minimum of 1-week notice for required construction staking. The Engineer has established horizontal references and vertical grade datum for the Contractor's use. The Contractor shall be responsible for protection and preservation of the established reference points. Re-establishing the horizontal and vertical control will be done at the expense of the Contractor by Owner's surveyors. The Engineer's construction staking scope of work is included in Part 4 – Reference Documents, Appendix J – Construction Staking Scope.

The bidder shall be familiar with all Federal, State, and local requirements that affect the completion of work in any way (such as laws, ordinances, or rules affecting employees, subcontractors, materials, equipment or procedures). In addition, the Contractor must comply with the following Washington State Laws, including without limitation: Chapter 60.28 RCW (retainage); 39.08 RCW (bond requirements); 18.27 RCW (contractor registration); 35.22.650 RCW (equal opportunity); and 70.92 RCW (handicapped). The Owner will not consider any plea of misunderstanding or ignorance of such requirements.

The Owner will assist with coordinating City permit applications, if needed. The Contractor is to pick up the Land Disturbance permit from the City and fill-out remaining information required, prior to mobilization. However, the Contractor will be responsible for providing submittal information, as needed (including shop drawing, mechanical, and plumbing information) to the Engineer/City (if requested). Temporary permits, easements, and other Non-City permits shall be acquired by the Contractor (if needed).

8. EXISTING UTILITIES

The location of all existing utilities shown on the plans is per the best available information, and is therefore approximate only. The Owner/Engineer does not guarantee the accuracy of this information. The contractor shall take whatever measures deemed necessary to verify the accuracy of this information and the cost of such shall be incidental to the bid.

Forty-eight (48) hours prior to starting construction, the Contractor shall contact the City of Ferndale and Underground Utility Locate (if needed). All costs incurred by the Contractor in complying with the requirements of this Section shall be incidental to the entire project and shall be included in the contract price.

9. CONNECTIONS TO EXISTING MAINS (WATER MAINS AND SEWER FORCE MAINS)

Connection to existing mains is the full responsibility of the Contractor. Temporary routing of existing pipelines or services, shoring, temporary thrust blocks, extra fittings required to route the pipe over or under existing or new pipe or other utilities and all other work and materials required for making complete, permanent and workable connections are incidental to other items of work.

The Contractor shall be responsible for determining which residents will be affected by shutoffs, and will notify them in writing (with a copy provided to the City) 24 hours in advance. In addition, the Contractor shall notify private property owners or tenants, by having a representative of the Contractor personally contact the private property owner or tenant. If the property owner or tenant is not available, the Contractor shall leave a door hanger notice indicating the commencement date of work, duration of work, the type of work being done, and the Contractor's and Engineer's phone number and address for questions and concerns. The Engineer shall be provided adequate time to review, comment, and approve the door hanger notice prior to the Contractor placing any notices.

The Contractor shall locate and verify the type of pipe, size and depth prior to making the connection. Detailed sketches and plans of the connection proposed by the Contractor shall be given to the Engineer not less than one week prior to the expected construction. The City of Ferndale shall be notified not less than two (2) working days prior to connection to existing mains.

10. SUBSURFACE CONDITIONS

The CONTRACTOR shall make deductions and conclusions as to the nature of the materials to be excavated, the difficulties which may arise from subsurface conditions, and of doing any other work affected by the subsurface conditions and shall accept full responsibility. The accuracy of information furnished by the OWNER and/or ENGINEER and/or the plans and specifications as to underground structures, foundation conditions, character of soil, position and quantity of surface and ground water, etc., is not guaranteed. Bidders must satisfy themselves by personal examination and by such other means as they desire with respect to actual conditions in regard to existing groundwater or subsurface structures. Unforeseen conditions shall not constitute a claim for additional payment under the terms of the contract or constitute a basis for cancellation thereof.

PLAN AND PROCEDURES FOR THE UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS - The following **Inadvertent Discovery Plan (IDP)** outlines procedures to follow, in accordance with state and federal laws, if archaeological materials or human remains are discovered.

Recognizing Cultural Resources: A cultural resource discovery could be prehistoric or historic. Examples include:

- An accumulation of shell, burned rocks, or other food related materials,
- Bones or small pieces of bone,
- An area of charcoal or very dark stained soil with artifacts,
- Stone tools or waste flakes (i.e. an arrowhead, or stone chips),
- Clusters of tin cans or bottles, logging or agricultural equipment that appears to be older than 50 years,
- Buried railroad tracks, decking, or other industrial materials.

When in doubt, assume the material is a cultural resource.

On-Site Responsibilities:

STEP 1: STOP WORK. If any City employee, Contractor or Subcontractor believes that he or she has uncovered a cultural resource at any point in the project, all work adjacent to the discovery must stop. The discovery location should be secured at all times.

[K1]STEP 2: NOTIFY CITY PROJECT MANAGEMENT TEAM AND CR/ENV/NR CONTACTS. Contact the City Project Manager, Wilson Engineering LLC, and Drayton Archaeological Research.

Contacts:

City Project Manager:

Name: Mike Olinger

Phone: (360) 384-4006

Email: MikeOlinger@cityofferndale.org

Wilson Engineering LLC

Name: Jeff Christner, P.E.

Phone: (360) 733-6100 ex 252

Email: jgc@wilsonengineering.com

Cultural/Environmental/Natural
(CR/ENV/NR) Program Manager:

Name: Garth Baldwin, Drayton
Archaeological Research

Phone: (360) 739-3921

Email: garth@draytonarchaeology.com

The Project Manager or the CR/ENV/NR will make all other calls and notifications.

If human remains are encountered, treat them with dignity and respect at all times. Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection in place and to shield them from being photographed. **Call the Ferndale Police Department at 360-384-3390** (Do not call 911 or speak with the media)[K2].

11. **TRAFFIC CONTROL**

Traffic shall be maintained in accordance with WSDOT Section 1-07.23 of the WSDOT Standard Specifications and Manual of Uniform Traffic Control Devices. The Contractor shall not close any roadway without first obtaining authorization from the city. The cost for all necessary traffic control by the Contractor shall be incidental to the entire project and shall be included in the contract price.

12. **SUBCONTRACTING**
The Contractor shall perform work amounting to a minimum of 50% percent of the Awarded Contract Price using his own personnel and equipment. All subcontracting shall be in conformance with WSDOT Section 1-08.1 of the WSDOT Standard Specifications.
13. **PRE-CONSTRUCTION CONFERENCE**
A Pre-Construction conference shall be held at a time and place fixed by the Owner which will be within two weeks from the date of notification of award of contract. At a minimum, the Contractor's project manager and field superintendent are required to attend. Sub-contractors, suppliers and others interested are encouraged to attend.
14. **HOURS OF WORK**
The Contractor shall schedule operations so that the work will be performed during the hours of 7AM to 5PM Monday through Friday, excluding holidays. A normal 40-hour Monday through Friday work week (4 – 10hr or 5 – 8hr days) is intended. The Contractor shall compensate the City \$140 per hour for each hour over 40 hours per week worked to pay for additional inspection time. The Contractor shall obtain prior approval from the City for overtime hours and schedules.
15. **COMPLETION DATE**
The contracted work is to be completed by no later than Phase 1 (Temporary Well Pump On-Line) = May 29, 2020 and Phase 2 (Substantial Completion) = July 31, 2020. The Contractor will be limited to 60 working days (12 weeks) on-site work. The Contractor shall plan accordingly to meet this completion requirement.
16. **SCHEDULE OF CONSTRUCTION & VALUES**
Within 10 working days of receiving the notice to proceed, the contractor shall furnish to the City a Schedule of Values. In addition, the Contractor shall furnish a Schedule of Construction at the Pre-Construction Meeting. The Schedule shall identify the project start and finish dates with a detailed breakdown of the proposed order of work and completion dates for major phases of the work. The schedule shall be developed by a critical path method. Time required for testing, backfiring, inspections, ordering, punch lists, etc. shall be incorporated into the schedule (although they do not necessarily need to be specifically identified).
17. **RETAINAGE**
The owner will deduct from the partial pay estimate a retainage of five percent (5%). Upon completion of all work, specified training, final inspection, and acceptance by Owner, the amount retained under the Contract will be paid within thirty (30) days following final acceptance by Owner and receipt by the Owner of the following:
- State Department of Labor and Industries Release
 - Washington State Department of Revenue Release
 - Washington State Employment Security Department Release
 - Contractor and Subcontractors Affidavit of Wages Paid
- The retainage will not be released if any claim has been filed on the project.
18. **LIQUIDATED DAMAGES**
Liquidated damages will be assessed in accordance with WSDOT 1-08.9 for each working day beyond the Contracted completion dates (both Phase 1 and Phase 2 dates) listed above.

19. PHYSICAL COMPLETION FOR WELLHOUSE PROJECT

Completion of the Shop Well #2 Wellhouse Project shall be defined as follows, with no exceptions:

Phase 1 (Temporary Well Pump On-Line):

The new well building and temporary well pump shall be able to be put to beneficial use. This shall include construction of the yard piping and piping inside the well building, electrical, instruments, and controls.

Phase 2 (Substantial Completion):

In addition to placing the new well building online, the SCADA/PLC programming work shall be finalized, the new generator shall be tested and placed in service, the old generator shall be completely disconnected and handed over to the City, site work shall be complete (finish grading, new curb and gutter, and asphalt pavement), new fencing and gates installed, and site restoration complete..

20. PAYMENT TO CONTRACTOR

At least five (5) working days before the end of the month, the Contractor shall submit to the Engineer an itemized application for payment, supported by receipt or other vouchers, showing payments for materials and labor, payments to sub-contractors, and such other evidence of the Contractor's right to payment as the Engineer may direct. The Owner's progress payment shall be made approximately 30 days after the date of submittal.

The owner will deduct from the partial pay estimate a retainage as defined above. Upon completion of all work, final inspection, and acceptance by Owner, the amount retained under the Contract will be paid at the expiration of the thirty (30) day period following final acceptance by owner provided the following conditions are met:

- A. Releases have been obtained from the State Department of Labor and Industries, the State of Washington Employment Security Department, the Washington State Department of Revenue, and all other departments and agencies having jurisdiction over the activities of the Contractor.
- B. No claims, as provided by law, have been filed against the retained percentage.
- C. Affidavit of Wages Paid is on file with the Owner for the Contractor and all Subcontractors.
- D. All contract work is complete in every respect, including operations and maintenance manuals, as-built drawings, etc.

21. INDEMNIFICATION

The Contractor agrees to protect, indemnify, and hold harmless the Owner, Engineer and their employees, agents, and staff, from all claims, liabilities, damages, expenses, or rights of action, directly or indirectly attributable to the Contractor's activities in connection with this contract, except for the sole negligence of the Owner or Engineer as outlined in Section WSDOT 1-07.14.

22. RECORD DRAWINGS

Before receiving payment for more than 90% of the work or declaring physical completion of the work, the Contractor will provide the Owner with accurate record information of all construction activity for the entire project (red line drawing on a full-size print). This red line drawing shall include, but not be limited to, any changes to the project and the exact location of all constructed utilities and any other existing utilities discovered during construction that are not identified on existing record information. The red line drawing shall be based on accurate field measurements tied to project

benchmarks. The Owner will use this information to prepare Record Drawings. The cost for furnishing this record information shall be considered incidental to the entire project and shall be included in the contract price.

23. BARRIER REQUIREMENTS

During construction, the Contractor shall always maintain satisfactory and substantial temporary fencing, railing, barricades or steel plates at all openings, obstructions or other hazards. All such barriers shall have warning signs or lights as necessary for safety. Safe access to and protection of the construction site and the Contractor's records shall be maintained always.

24. CONTROL OF WORK

The presence or absence of an Inspector at the job site will be at the sole discretion of the Owner and such presence, or absence, of an Inspector will not relieve the Contractor of his responsibility to obtain the construction results specified in the Contract Documents. The Owner, Inspector and Engineer do not purport to be Safety Engineers and are not engaged in that capacity and shall have neither authority nor responsibility to enforce construction safety laws, rules, regulations, procedures or the safety of persons on and about the construction site. Any personal assistance which an Inspector may give the Contractor will not be construed as the basis of any assumption of responsibility in any manner, financial or otherwise, by the Owner, Inspector, or the Engineer. The Inspector is on site to ensure the project is completed in accordance with all plans and specifications, to ensure the Owner is getting what is required. They are not there to do the Contractor's scheduling or contact his subs or deliver messages.

25. BLASTING

Blasting is not anticipated and will not be permitted without expressed written consent of the Owner. If blasting is permitted, contractor is responsible for obtaining all necessary permits and insurance.

26. INSURANCE

The Contractor shall take out and maintain during the life of this contract Public Liability Insurance for bodily injury and property damage liability including without limitation, coverage for explosion, blasting, collapse and destruction of underground utilities (X.C.U.) and contingent liability, including products and completed operations and blanket contractual liability, as shall protect the Contractor, the Owner and the Engineer. The Contractor shall have the Owner and the Engineer specifically added as additional named insured in said policies (on Form B), all at no cost to the Owner or the Engineer. The above insurance shall cover the Owner, the Engineer, Contractor and Subcontractors for claims or damages for bodily injury, including wrongful death, as well as other claims for property damage which may arise from operations under this contract whether such operations be by themselves or by any subcontractor or anyone directly or indirectly employed by either of them. The Contractor agrees, in addition, to indemnify and save harmless the Owner and Engineer, either or both, from all suits, claims, demands, judgements, and attorney's fees, expenses or losses occasioned by the performance of this Contract by the Contractor or Subcontractor or persons working directly or indirectly for the Contractor or Subcontractor, or on account of or in consequence of any act or omission of any such person, including but not limited to neglect in safeguarding the work, or failure to conform with the safety standards for construction work adopted by the Safety Division of the Department of Labor and Industry of the State of Washington.

The amount of such insurance shall be as follows:

Bodily injury liability insurance in an amount not less than \$1,000,000.00 for injuries, including wrongful death, to any one person and subject to the same limit for each person, in an amount not less than \$2,000,000.00 on account of any one occurrence, and property damage liability insurance in an amount not less than \$1,000,000.00 for each occurrence. Builders Risk (All Risk Insurance) coverage equal to project bid amount.

The Contractor shall not cause any policy to be canceled or permit it to lapse, and all policies shall include a clause to the effect that the policy or certificate shall not be subject to cancellation or to a reduction in the required limits of liability or amounts of insurance or any other material change until notice has been mailed to the Engineer and Owner stating when, not less than thirty (30) days thereafter, such cancellation or reduction or change shall be effective. In the event notice of cancellation is received by the Owner, the Contractor shall immediately obtain other comparable insurance acceptable to the Owner and provide proof thereof to the Owner. In the event the Contractor is unable to obtain and provide such insurance, the Contractor shall immediately cease all work on the project, save and except that which is necessary to secure the site and prevent injury.

All certificates of insurance, authenticated by the proper officer of the insurer, shall state in particular those insured, the extent of the insurance, the location and operations to which the insurance applies, the expiration date, and the above-mentioned notice of cancellation clause.

Provided, however, the Owner may accept insurance covering a Subcontractor in character and amounts less than the standard requirements set forth under this subsection where such standard requirements appear excessive because of the character or extent of the work to be performed by such subcontractor.

A Certificate of Insurance evidencing coverage and a copy of the endorsement naming the Owner and Engineer as additional insured must be submitted to the Engineer prior to the commencement of the Contract in accordance with WSDOT Section 1-03.3.

The following endorsement for additional insured shall be included in all applicable policies and on the Certificate of Insurance:

The Owner and Engineer are additional named insured for all coverages provided by the policy of insurance and shall be fully and completely protected from all claims and risks by this policy and for any and every injury, death, damage, and/or loss of any sort whatsoever, including consequential damages, sustained by any person, organization or corporation in connection with any activity performed by the Contractor or any subcontractors or by anyone directly or indirectly by virtue of the provisions of that contract between the (Owner name), as Owner and (Contractor's name), entitled (Project Title), dated (date).

The coverages provided by this policy to the Owner or any other named insured shall not be terminated, reduced, or otherwise modified in any respect without providing at least 30 days prior written notice by certified mail to the Owner and other additional named insured. The coverages provided by this policy are primary to any insurance maintained by the Owner.

Third-Party Beneficiary: All parties agree that the State of Washington shall be, and is hereby, named as an express third-party beneficiary of this contract, with full rights as such.

27. CHANGES

The Owner reserves the right to make changes in the work within the general scope of the Contract Documents at any time during the progress of the work. The Contractor shall perform all work in accordance with the changes specified by the Owner.

Changes required by the Owner may include but are not limited to:

- (a) Deletion of any portion of the work.
- (b) Increases or decreases in quantities.
- (c) Changes in specifications and/or designs.

- (d) Method or manner of performance of the work.
- (e) Addition of any new work.
- (f) Acceleration or delay in the performance of the work.

The Owner shall have the option of paying for such changes by one or more of the following methods:

- (1) by the lump sum or unit contract prices set forth in the Proposal;
- (2) by equitable adjustment mutually agreed upon by the Contractor and the Owner; or
- (3) by Force Account in accordance with WSDOT Section 1-09.6

In the case that the Contractor and the Owner are unable to agree on the amount of equitable adjustment, the Owner will unilaterally determine the amount to be paid for the change in accordance with WSDOT Section 1-09.4. The Owner's decision concerning such amount to be paid shall be final as provided in WSDOT Section 1-05.1.

All administrative costs associated with change orders shall be considered to be part of the Contractor's overhead for the work as bid and not a direct cost of the change. Such administrative costs shall include, but not be limited to, costs of defining changed work, determining estimated cost of changed work, preparing proposals for change orders and negotiation of the method and amount of compensation for changed work.

The compensation for each change shall include all direct and indirect costs including, but not limited to, costs of impacts on related and indirect operations and of delay or acceleration of other work resulting from the change. Failure of the Contractor to identify all direct and indirect costs at the time of negotiation of compensation for each changed shall preclude subsequent claim, after formal execution of a change order, by the Contractor for any additional costs associated with the change.

No payment for extra work or any other change in the contract will be made unless the extra work or change has been authorized by the Owner prior to start of the extra work by the Contractor.

For (a) Deletion of any portion of the work, above, the following requirements shall apply:

No payment will be made for items which are deleted from the contract and not performed. No payment will be made for any anticipated profits which would have been earned on work deleted. Payment for costs incurred by the Contractor prior to the deletion of the work shall include and be limited to actual documented costs of field labor, equipment and materials and shall not cover and include overhead as defined in WSDOT Section 1-09.6.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of cancellation of the work will be either purchased from the Contractor by the Owner at the actual cost and shall become property of the Owner or the Owner will reimburse the Contractor for his actual costs connected with returning these materials to the suppliers.

For (b) Increases or decreases in quantities, above, the following requirements apply:

Payment for all bid items shall be at the unit prices bid, regardless of the actual final quantities of the bid items incorporated into the work and regardless of any increase or decrease from the quantities designated in the Schedule of Contract Prices.

No extra or additional payment will be made for any increase in quantity of any bid item. No extra or additional payment will be made for any decrease in quantity of any bid item. No payment will be made for any anticipated profits which would have been earned on deleted quantities.

For (c) Changes in specifications and/or designs; (d) Addition of any new work; and (e) Acceleration or delay in the performance of the work above, the following requirements shall apply:

If the Engineer determines that the above changes cause an increase or decrease in the Contractor's cost of performance of that portion of the work associated with the change and/or an increase or decrease in the contract time required for performance of the work, the increase or decrease in compensation and/or contract time will be determined by agreement of the parties.

28. INCREASED OR DECREASED QUANTITIES

The Contractor shall not purchase or place orders for full quantities of materials until the work has advanced to a state permitting the determination of the exact quantities required. The original bid item quantities designated on the Proposal and other estimates of quantities of materials furnished by the Engineer shall be considered as approximate and not indicative of the actual quantities required. The Owner will not be responsible for any materials purchased in excess of actual requirements and will not be responsible for any increased costs or extra expense that the Contractor may have on account of materials or work not being ordered at some earlier date.

29. SALES TAX

The work is within the City of Ferndale. The Contractor shall correctly reference on payments of sales tax to the Washington Department of Revenue Ferndale's tax code.

30. GUARANTEES

Except where special longer warranties are required, the Contractor shall guarantee all materials and workmanship for a period of one year from the date of Substantial Completion of the project.

Neither final acceptance by the Owner nor partial and final payment nor any provision in the Contract Documents shall relieve the Contractor of responsibility for faulty materials or workmanship.

If, prior to the expiration of one year after the date of the City's acceptance of all work or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any work is found to be defective or not in compliance with the Contract Documents, the Contractor shall promptly, without cost to Owner, either correct such work, or, if it has been rejected by Owner, remove and replace it with acceptable work. If the Contractor does not promptly comply with the notification issued by the Owner for correction of defective and/or non-complying work and have the defect completely repaired within 30 calendar days, the Owner may have the work corrected or removed and replaced and all direct and indirect costs of such removal and replacement, including costs of all professional services, shall be paid by Contractor.

The guarantee shall apply to all elements and parts of the work, regardless of knowledge by the Owner, engineer and inspector(s) of defects or deficiencies and regardless of failure of the Owner, Engineer and/or inspector(s) to inform the Contractor of known or suspected defects or deficiencies prior to Substantial Completion of the work by the Owner.

All subcontractors', manufacturers', and suppliers' warranties and guarantees, express or implied, for any part of the work, materials and equipment shall be deemed obtained and shall be enforced by the Contractor for the benefit of the Owner without the necessity of formal transfer or assignment

thereof. Warranties and guarantees by subcontractors, manufacturers, and suppliers shall begin on and extend for one year after the date of Substantial Completion of all work.

All work (including materials and equipment) repaired or replaced in accordance with this Section shall be guaranteed for a period of one year after the date of City's acceptance of the repair/replacement work.

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

PART 3 - TECHNICAL SPECIFICATIONS

SECTION 01 11 10 – SUMMARY OF WORK

PART 1. GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The work covered by the Contract Documents consists of furnishing all labor, equipment and materials necessary for the construction of the Shop Well #2 Building as shown on the plans and specified herein.
- B. Contractor shall furnish all labor, tools, equipment and materials not pre-purchased or supplied by the Owner. In addition, the Contractor shall provide demolition, shoring, bracing, sheeting, cribbing, falsework, pumping, dewatering, drainage, forms, and all material as required or necessary to demolish, excavate, backfill, grade, construct, lay, erect, install, test, and clean-up site. The work shall consist of, in general, the construction of the new Shop Well #2 Wellhouse and associated work.

A more detailed summary of the work is included in Section 00 24 13 SCOPES OF BID.

1.02 WORK AND RESPONSIBILITIES

- A. Unless otherwise indicated, work and responsibilities include, but are not limited to the following:
 - 1. Providing and paying for labor, materials, equipment, tools, machines, facilities, and services necessary for execution and completion of work.
 - 2. Paying required taxes.
 - 3. Giving required notices.
 - 4. Enforcing strict discipline and good order among employees.
 - 5. Using new materials, except as noted.
 - 6. Maintaining required egress and other requirements in accordance with governing Codes and Ordinances throughout the work.
 - 7. Obtaining and paying for required permits, fees and notices, see General Conditions.

1.03 SEQUENCE/PHASING

- A. These documents are not to be interpreted implicitly or explicitly as definition of procedure and sequence of operations. Order as to procedure and sequence of operations are Contractor options, consistent with contract documents and as approved by Owner. A preliminary construction phasing plan is included in Section 00 31 13 PRELIMINARY PROJECT PHASING.
- B. Site Work: Proposed stockpiling areas must be approved by the Owner.

1.04 COOPERATION AND COORDINATION

- A. Contractor is responsible for coordinating and scheduling work of subcontractors to expedite progress of the Project.
- B. Subcontractor Instructions: Subcontractors to become familiar with Conditions of the Contract and the work of other Sections related to their own work.
- C. Project Coordination and Scheduling Control: Responsibility for coordination and close adherence to time schedules rests solely with the General Contractor who shall maintain coordination and scheduling control at all times.

- D. Each separate contractor and each subcontractor responsible to the General Contractor shall cooperate diligently with the General Contractor in the execution of their work so as to cause no delay in the completion of the Project. This responsibility includes the completion of all work in a timely manner and all items of equipment connected and fully operating at the time of Substantial Completion. Each separate contractor and each subcontractor shall diligently comply with the following requirements:
1. Inform other trades of requirements at proper time to prevent delay or revisions.
 2. Be informed on the requirements of other trades and check own work for conflicts with the work of other trades.
 3. Insure delivery of materials and performance of work on coordinated schedule with other trades.
 4. Contractor is to ensure the subcontractors and equipment suppliers are responsible for compatibility and completeness of the installation and operation of the equipment in their respective Specification Sections including conformance with code requirements. If power, piping, conduit, or other work required for complete installation is not provided by others to equipment location or is not adequate for complete installation, the subcontractor or equipment supplier shall be responsible for providing the necessary connections.
- E. Notification and Correction of Defective Work: Before starting a section of work, each contractor and subcontractor shall carefully examine all preparatory work that has been executed to receive his work. Check carefully, by whatever means required, to ensure that the work and adjacent, related work will finish to proper contours, planes, and levels. Promptly notify the Contractor of any defects or imperfections in preparatory work which will in any way affect satisfactory completion of the work. Under no condition shall a section of work proceed prior to preparatory work having been completed, cured, dried, or otherwise made satisfactory to receive such related work. Correction of defective work shall be the responsibility of the contractor or subcontractor providing the defective work. Correction of work due to underlying defects shall be the responsibility of the contractor or subcontractor providing work.
- F. Intent of Drawings: The work of each contractor and subcontractor shall conform to the intent of the contract drawings. Drawings showing work of other trades are partly diagrammatic and do not intend to show in details all features of work. Each contractor shall carefully review and compare related drawings and shall thoroughly understand the building conditions affecting their work. All changes required in the work caused by failure to do so shall be at no expense to the Owner. The design is based upon dimensions and requirements for the equipment of the "first-named" manufacturer. All changes required in the work caused by the use of an approved "substitute" to the first-named manufacturer shall be at no expense to the Owner.
- G. Interferences and Right-Of-Way: Make proper provisions to minimize interferences. Where conflicts occur, gravity drainage improvements have right-of-way over mechanical and electrical work; electrical work has right-of-way over landscaping work. Submit conflicts which cannot be resolved by right-of-way to Engineer for instructions.
- H. Cooperate and coordinate with any other separate Contractors under Contract with the Owner.

1.05 CONSTRUCTION STAGING AREA

- A. Coordinate staging areas with the City.

1.06 EXISTING UTILITIES

A. Administrative Requirements

1. The Contractor is advised that underground excavation is regulated under RCW Chapter 19.122. Included therein are the following requirements:
 - a. 48-hours before beginning any excavation work, the Contractor shall inform local utilities through the utility one-call locator service at (800) 424-5555 or 811;
 - b. Protect existing utilities in the vicinity of excavation work;
 - c. In the event of any damages, notify the utility purveyor and the utility one-call locator service immediately;
 - d. Immediately repair any damaged utilities deemed to be an emergency;
 - e. Coordinate non-emergency repairs with the utility purveyor;
 - f. Provisions for assigning the financial liability of any repair work.
 - g. Further, the Contractor is required to contact the Engineer, Wilson Engineering, LLC (Jeff Christner, P.E.), 48-hours before starting construction at (360) 733-6100.

B. Field Protection Requirements

1. Utilities of record are shown on the Drawings insofar as possible to do so. These, however are shown for convenience only and the Owner and his representatives assume no responsibility for improper locations or failure to show utility locations on the Drawings. At Contractor's expense, immediately repair utilities damaged during construction.

1.07 MISCELLANEOUS

A. Additional work items include, but are not limited to:

1. Maintaining a pedestrian and vehicular access to and around existing projects.
2. Not unreasonably encumbering site with materials or equipment.
3. Assuming full responsibility for protection and safekeeping of products stored on premises.
4. Moving any stored products interfering with any other Contractors.
5. Obtaining and paying for use of additional storage or work areas needed for operations.
6. Restoration of any damage to existing improvements adjacent to work site.
7. Moving and replacing items incidental to completion of the work including mailboxes, fences, small shrubs and trees, street signs, yard decorations, etc.

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

SECTION 01 31 00 – PROJECT COORDINATION

PART 1. GENERAL

1.01 DESCRIPTION OF WORK

- A. Project meetings will be held to accomplish the following:
 - 1. Coordinate the work of the project and resolve any conflicts or construction problems.
 - 2. Establish a sound working relationship between the Contractor, Owner, and Engineer.
 - 3. Establish sound working procedures.
 - 4. Review job progress and quality of work.
 - 5. Expedite the work to completion within the scheduled time limit.
- B. Representatives of Contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.02 RELATED SECTIONS:

- A. Related work specified elsewhere:
 - 1. Section 00 25 13 - Pre-Bid Conference
 - 2. Section 00 31 13 - Preliminary Project Phases
 - 3. Section 01 11 00 - Summary of Work
 - 4. Section 01 33 00 - Submittals:

1.03 PRECONSTRUCTION MEETING

- A. The pre-construction meeting will be scheduled within the time frame identified in the General Conditions after the Notice to Proceed has been issued. The Owner will notify the Contractor as to the time and place of the meeting.
- B. Present at the meeting shall be a representative of the Owner, the Engineer, the Contractor, Project Superintendent, and major subcontractors.
- C. The Contractor must be prepared for a thorough discussion and review, as well as revisions which may be deemed necessary in the opinion of the Owner, of the following:
 - 1. General project information
 - 2. Responsibilities of all involved parties
 - 3. Content of the contract
 - 4. Contractor's schedule
 - 5. Project Phasing and Schedule of construction
 - 6. Penalties and Liquidated Damages
 - 7. Subcontracts
 - 8. Status of Owner furnished materials
 - 9. Change order procedures
 - 10. Staking of work

11. Project inspection
12. Acceptance of work
13. Labor standards requirements
14. Rights-of-way and easements
15. Placement of project signs and posters
16. Handling of disputes
17. Additional issues as required.

1.04 PROGRESS MEETINGS

- A. Unless otherwise required, progress meetings will be held by the Owner on a weekly basis at a location near the site. Present at these meetings shall be the Contractor, subcontractors and suppliers as required, the Owner and other interested parties, i.e., material suppliers, public utility, etc.
- B. The Contractor must be prepared for a thorough discussion and review, as well as revisions which may be deemed necessary in the opinion of the Owner, of the following:
 1. Review work since previous meeting.
 2. Make field observations and address any conflicts or problems.
 3. Review material delivery schedules
 4. Review work progress including any issues that may impact project schedule.
 5. Review submittal schedule.
 6. Maintenance, testing and quality standards.
 7. Review any proposed changes.
 8. Review pay requests and procedures.
- C. The Owner shall preside over progress meetings. The Engineer shall be responsible for taking minutes, recording all significant proceedings and decisions. Copies of minutes shall be distributed within one week after the meeting.

1.05 SCHEDULE

- A. The Contractor shall develop and submit a preliminary construction progress schedule for the contracted work. This schedule shall be submitted to the Owner within 10 days of Contract Award.
- B. Schedule shall be a critical path diagram depicting the first day of each week and sized to be legible and permit notations and future revisions.
- C. Schedule shall be arranged chronologically by the start date of each item, and consider the following:
 1. The estimated construction progress schedule shall:
 - a. Show complete sequence of construction by activity.
 - b. Show start and stop dates of each major construction element.
 - c. Show projected percent completion for each major construction element at the first of each month.
 2. Through construction, the Contractor shall record progress of each major construction element.

3. Revisions shall show changes relative to previously submitted schedules and updated projections of progress and completion.
 4. The schedule shall be updated on a monthly basis and submitted with the pay estimate.
- D. The schedule and all subsequent revisions shall be kept at the Contractor's field office with copies available for the Engineer and Owner.

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

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1. GENERAL

1.01 DESCRIPTION OF WORK

- A. Summarize, but not necessarily a complete listing, submittals required of the Conditions of the Contract and the General Requirements.
- B. General procedures for specification submittals. Specific requirements for submittals are included in the individual sections.

1.02 RELATED SECTIONS

- A. Related work specified elsewhere:
 - 1. Section 00 73 00 – Supplementary Conditions
 - 2. Section 01 70 00 - Contract Closeout

1.03 SUBMITTAL SCHEDULE

This listing of submittals is a checklist for the Contractor's convenience and is not an exhaustive listing of provisions of any law or the requirements of these Contract Documents. The Owner reserves the right to amend this list.

- A. With his bid, the Contractor shall furnish the following:
 - 1. Bid Proposal (Section 00 41 00 BID PROPOSAL)
 - 2. Bid Guarantee (Section 00 43 13 BID BOND or other type of Bid Guarantee),
 - 3. Certification of Nonsegregated Facilities (Attachment 3 of Section 00 73 00 SUPPLEMENTAL CONDITIONS),
 - 4. EPA Form 6100-3 DBE Program Subcontractor Performance Form (Attachment 6 in Section 00 73 00 SUPPLEMENTAL CONDITIONS) for all DBE subcontractors.
 - 5. EPA form 6100-4 DBE Program Subcontractor Utilization Form (Attachment 7 in Section 00 73 00 SUPPLEMENTAL CONDITIONS).
- B. Within 1-hour of the bid, the Contractor shall furnish the following:
 - 1. List of Subcontractors (Section 00 43 36 PROPOSED SUBCONTRACTORS FORM).
- C. Within 24-hours of bid opening, Bidders so directed shall furnish the following:
 - 1. Contractors Qualifications, (as described in Section 00 22 13 SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA).
 - 2. Subcontractors Qualifications, (as described in Section 00 45 14 SUBCONTRACTOR QUALIFICATIONS).
- D. Prior to executing the Contract Agreement, (Section 00 52 00 AGREEMENT FORM), the Contractor shall furnish the following:
 - 1. Payment and Performance Bonds, (Section 00 61 13 PERFORMANCE AND PAYMENT BONDS FORMS).
 - 2. Insurance Certificates.
 - 3. Prevailing wage rate requirements.

- E. 10 days after execution of the Agreement, the Contractor shall furnish the following:
 - 1. Construction schedule.
 - 2. Requests for material substitutions.
 - 3. Schedule of Values for the work.
 - 4. Submittals for Temporary Sediment Filter Equipment System, Temporary Sediment Filter Pump System, and Pump System for Inlet to City's Permanent Disc Filter.
- F. After starting construction, each month the Contractor shall furnish the following:
 - 1. Application for Payment on Owner approved form with breakdown of work performed organized in accordance with the Schedule of Values.
 - 2. Updated construction schedule (submitted with each monthly pay request)
- G. 14-days prior to beginning any work at the WWTP which will necessitate a shutdown, the Contractor shall furnish a bypass pumping and emergency response plan for the site.
- H. Certified Payroll in accordance with current federal wage requirements of the Davis-Bacon Act, (per requirements of Section 00 73 00b SUPPLEMENTAL CONDITIONS).
- I. With the final application for payment, the Contractor shall furnish the following:
 - 1. Contractor's affidavit stating payment of subcontractors
 - 2. Subcontractors' statements of being paid
 - 3. Final location, by each property, of all items on private property for which payment is requested.
- J. Before releasing retained funds, the Contractor shall furnish the following:
 - 1. Record drawings and related contract closeout documents
 - 2. Affidavits of Payment (wages, subcontractors, taxes, etc.)

1.04 GENERAL SUBMITTAL REQUIREMENTS

- A. Identification of Submittals
 - 1. Identify each submittal with Project title and number; clearly define location of submittal in the project and/or its location in the Contract Documents.
 - 2. It is the responsibility of the Contractor to coordinate the work of the various trades involved with the work under this agreement. Contractor shall check all submittals by his subcontractors and mark them with his approval prior to submittal.

1.05 SUBMITTAL OF SHOP DRAWINGS & SAMPLES

- A. General
 - 1. Provide submittals in PDF format.
 - 2. Submittal of shop drawings and samples shall be accompanied by a transmittal letter containing project name, Contractor's name, number of drawings and samples, titles and other pertinent data.
 - 3. Shop drawings shall be at a convenient size. A space shall be provided in the lower right-hand corner for the review stamp.

4. The Contractor is responsible for obtaining and distributing required prints of shop drawings to his subcontractors and suppliers.
5. Contractor shall maintain a complete material list and file of approved submittals at the project site for use as reference by interested parties.

B. Samples

1. Form of Submittal: When samples are specified to be submitted, furnish two samples, except as noted herein, of sufficient size to indicate general visual effect or as otherwise specified in the specifications, and in as nearly the form in which the material will appear on the project as practicable; i.e., submit paint on samples of actual material for which they are specified as a finish; one set of reviewed and selected samples will be retained by the owner.
2. Review:
 - a. The Owner will check submitted samples against file samples and project requirements, will make final selection of colors and finishes from samples, and will approve sample for application on the project in conformance with the Specifications.
 - b. Should a submitted sample not be in conformance with the specifications, resubmit sample which conforms with the requirements of Contract Documents.

C. Catalog Cuts, Data & Brochures

1. Where indicated in the Specifications, catalog cuts and similar data will be accepted in lieu of shop drawings, provided they contain required information and are clearly printed. Submit manufacturer's descriptive data including catalog sheets for materials, equipment and fixtures, showing dimension, performance characteristics and capacities, wiring diagrams and controls, schedules, and other pertinent information as required.

D. Submittal of Product Certificates

1. Where manufacturer certificates are specified to be furnished attesting to conformance with specification requirements, submit certificates in triplicate prior to acceptance of the Work.

E. Test Reports

1. Submittal is classified either as "shop drawing" or "product data", depending upon whether the report is uniquely prepared for the project or a standard publication of regular product or workmanship control testing at the point of production (respectively).
2. Refer to individual sections of the Specifications for specific requirements; furnish three (3) copies when required.

F. Warranties

1. Provide warranties, guarantees and/or maintenance agreements where the Specifications require a period longer than the Contractor warranty period.

G. Operation & Maintenance Data

Furnish instructions and data on materials and equipment installed in the work in accordance with requirements of the technical provisions of the specifications and assemble as specified below. These manuals shall be submitted prior to application for

payment exceeding 90% of the total contract amount.

1. Provide four (4) hard copy sets and two (2) electronic copy sets of Operation and Maintenance Data. Each hard copy set shall be bound in separate commercial quality three-ring binders with durable and cleanable plastic covers. The words "Operation and Maintenance Manual (or Instruction)" along with the type of equipment covered shall be typed or neatly printed on the cover. The electronic copy sets shall be in PDF format and stored on either CD or flash drive units.
2. Each set shall be complete with an index and, as a minimum, cover the following items:
 - a. Name, location and telephone number of manufacturer and product's model number.
 - b. Name, location and telephone number of nearest supplier and spare parts warehouse.
 - c. Start-up procedures and normal operating characteristics and instruction.
 - d. Regulation, control, shut-down and emergency instructions.
 - e. Recommended preventative maintenance procedures including a lubrication schedule with recommended lubricants.
 - f. Trouble-shooting guide.
 - g. Complete nomenclature and commercial number of all parts including exploded views of each assembly.
 - h. List of recommended spare parts.
 - i. Complete as-built elementary wiring and outline diagrams.
 - j. Statements of warranty or guarantee.
3. Operation and Maintenance Manuals shall be submitted in at least draft form for Engineer's review with Shop Drawings, Catalog Cuts and other material submittal data. Final drafts, incorporating Engineer's comments, shall be submitted prior to Contractor's application of payment for 75 percent or more of the work.
4. Contractor shall maintain a complete file of all Engineer reviewed Operation and Maintenance Manuals at the project site for use as a reference by interested parties.

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

SECTION 01 41 00 – REGULATORY REQUIREMENTS

PART 1. GENERAL

1.01 SECTION INCLUDES

As required by General Conditions: "Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work." Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER will be responsible for monitoring CONTRACTOR'S compliance with any Laws and Regulations. Contractor is responsible for keeping the District, Labor & Industries and other authorities completely informed of any changes in the work in a timely manner, and is responsible for informing them of any changes in the work which may affect codes and laws. This includes contract modifications, amendments, additions, shop drawings, and the like, current as of Project Manual date.

- A. Make any and all adjustments and modifications as required to conform to ordinances, and regulations.
- B. Referenced codes establish minimum requirement levels. Where provisions of various codes or standards conflict, the more stringent provisions govern. Promptly submit to Engineer written notice of observed contract document variations from legal requirements.
- C. Compliance requirements include, but are not limited to following:
 - 1. International Building Code and Related Standards, most recent edition, published by the International Conference of Building Officials.
 - 2. State Rules and Regulations for Barrier Free Design/WAC 51-10.
 - 3. The Americans with Disabilities Act (ADA) "Accessibility Guidelines for Buildings and Facilities."
 - 4. Washington State Department of Labor and Industries Regulations.
 - 5. Electrical Work:
 - a. Underwriters' Laboratories (UL).
 - b. National Electrical Manufacturers' Association (NEMA).
 - c. NFPA, National Electric Code (NEC), National Electric Safety Code, and above electrical listings, as applicable.
 - d. State Electrical Construction Code.
 - 6. Environmental Requirements: All work to be performed in compliance with relevant statutes and regulations dealing with prevention of environmental pollution and preservation of public natural resources.
 - 7. Standard Specifications for Road and Bridge Construction, Washington State Department of Transportation, (WSDOT) latest edition.
 - 8. Standard Specifications for Municipal Public Works Construction, Washington State Chapter, American Public Works Association, latest edition.
 - 9. Whatcom County Standards, latest editions.
 - 10. City of Ferndale Standards, latest edition.

1.02 MISCELLANEOUS EXPLANATIONS/INTENT

- A. Number of Specified Items Required: Wherever in these Specifications an article, device, or piece of equipment is referred to in the singular number, the reference applies to as many such articles as are shown on the Drawings or required to complete the installation.
- B. Drawings/Diagrammatic:
 - 1. Drawings are in part diagrammatic and do not necessarily show complete details of construction, work or materials, performance or installation. And they do not necessarily show how construction details, other items or work, fixtures, and equipment may affect any particular installation. Contractor is required to ascertain and correlate the work to bring the parts together into a satisfactory and completed whole.
 - 2. Furnish and install work not covered under any heading, Section, branch, class or trade of the project manual, but shown on or reasonably inferable from the Drawings. This includes all work necessary to produce the intended results. Install similarly for items more positively indicated.
- C. Wording of these Specifications: These Specifications are of the abbreviated or streamlined type and may include incomplete sentences.
 - 1. Words such as "shall", "the Contractor shall", "shall be", and similar mandatory phrases, are required to be supplied by inference in the same manner as they are in a note on the Drawings.
 - 2. Provide all items, articles, materials, and operations listed, including all labor, materials, equipment and incidentals, required for their completion.
- D. Tense, Gender, Singular, Plural: Present tense words include future tense. Words in masculine gender include feminine and neutral genders. Words in the singular include plural. Plural words include singular.
- E. All, Entire, and the Like: For brevity throughout the documents, these words may be omitted. Read their implications into all work.
- F. Specifications by Reference: Any material specified by reference or number, symbol or title of a specified standard, such as commercial standard, ANSI and ASTM documents, Federal Specifications, trade association standard, or the like, shall comply with the following:
 - 1. The latest revision requirements thereof, and any amendment or supplement thereto, in effect on Bid date or date of Owner-Contractor Agreement when there are no bids.
- G. Dimensions and Measurements on Drawings: Dimensions govern. Do not scale. Contractor is to check all dimensions in the field and verify them with respect to adjacent or incorporated work. Large scale drawings take precedence over plans, elevations, and cross sections.
- H. First Class Workmanship: First Class Workmanship is expected.
 - 1. Prior to installing any item or material, verify that receiving surfaces are plumb, level, true to line, and straight to the degree necessary to achieve tolerances specified or required. Perform without extra cost all shimmering, blocking, grinding, or patching required to make such surfaces plumb, level, true to line, and straight.

2. Take care in attention to details and fitting at intersections and junctures of materials. All joints are to be tight, straight, even, and smooth.
- I. Presence of Engineer/Owner: Do not misconstrue presence of this person or any of his representatives at the site as assuring compliance with Contract Documents.

PART 2. MATERIALS (NOT USED)

PART 3. EXECUTION (NOT USED)

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

SECTION 01 45 00 – QUALITY CONTROL

PART 1. GENERAL

1.01 DESCRIPTION OF WORK

- A. Inspection and testing laboratory qualifications, duties and responsibilities.
- B. Contractor's quality control requirements.

1.02 RELATED SECTIONS

- A. Related Requirements Specified Elsewhere:
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 01 66 00 – Product Storage and Handling Requirements
 - 3. Section 01 70 00 – Execution and Closeout Requirements
 - 4. Technical Specifications include quality control requirements for certain portions of the work.

1.03 APPLICABLE PUBLICATIONS AND REGULATORY REQUIREMENTS

- A. ASTM E329: Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as used in Construction.
- B. WSDOT and ASHTO: Applicable sections that pertain to compaction testing for subgrade, base and top course, and asphalt testing.
- C. Washington State Building Code and International Building Code Standards.
- D. Nothing in the Drawings or Specifications shall be construed to permit Work not conforming to applicable laws, ordinances, rules or regulations.
- E. When Drawings or Specifications exceed requirements of applicable laws, ordinances, rules, or regulations, comply with documents establishing the more stringent requirements.

1.04 DEFINITIONS

- A. Factory Tests: Tests made on various products and component parts prior to shipment to the job site, including but not limited to such items as pumps, valves, miscellaneous piping equipment, electrical equipment, and precast concrete.
- B. Field Tests: Tests or analyses made at, or in the vicinity of the job site in connection with the actual construction.
- C. Product: The term "product" includes the plural thereof, and means a type or a category of manufactured goods, constructions, installations and natural and processed materials or those associated services whose characterizations, classification or functional performances determination is specified by standards.
- D. Person: The term "person" means associations, companies, corporations, educational institutions, firms, government agencies, at the Federal, State and Local level, partnerships, and societies, as well as divisions thereof, and individuals.
- E. Testing Laboratory: The term "testing laboratory" means and "person", as defined above, whose functions include testing, analyzing, or inspecting "products" as defined above, and/or evaluating the designs or specifications of such "products" according to the requirements of applicable standards.
- F. Certified Test Reports: Certified test reports are reports of tests signed by a qualified

professional attesting that tests were performed in accordance with the test method specified, that the test results reported are accurate, and that items tested either meet or fail to meet the stated minimum requirements. These test reports include those performed by Factory Mutual, Underwriter's Laboratories, Inc., and others.

- G. Certified Inspection Reports: Certified inspection reports are those signed by approved inspectors attesting that the items inspected meet the specification requirements other than any exceptions included in the report.
- H. Manufacturer's Certificate of Conformance or Compliance: A certificate signed by an authorized manufacturer's official attesting that the material or equipment delivered meets the specification requirements.

1.05 QUALITY CONTROL REQUIREMENTS

- A. All work under the contract shall be inspected and tested as specified herein. The Contractor shall maintain records of all inspections and tests. Approvals shall be obtained before delivery of materials to the project site.
- B. The Contractor is responsible for all field testing (liner, concrete, and compaction). The Contractor is responsible for notifying Owner and coordinating compaction test requests as discussed elsewhere in these documents. The Contractor is responsible for the costs of any repeat tests required where failed compaction tests were obtained.
- C. If required, contractor responsibility for quality control testing shall be as follows:
 - 1. Factory Tests: Unless otherwise specified, the Contractor will arrange and pay for factory tests when required by the contract documents.
 - 2. Factory Inspection: Unless otherwise specified, the Contractor will arrange and pay for factory inspection when required by the contract documents.
 - 3. Field Inspection and Tests by the Contractor: Unless otherwise specified, the Contractor shall furnish all equipment, instruments, qualified personnel, and facilities necessary to inspect all work and perform all tests when required by the contract documents. All inspections and tests performed and test results shall be promptly submitted to the Owner.
 - 4. Approval of Testing Laboratories: All laboratory work under this contract shall be performed by a laboratory approved by the Owner.
- D. Laboratory Reports: Reports shall cite the contract requirements, the test or analysis procedures used, the actual test results, and include a statement that the item tested or analyzed conforms or fails to conform to the specifications requirements. All test reports shall be signed by a representative of the testing laboratory authorized to sign certified test reports. The Contractor shall arrange for immediate and direct delivery of the signed original of all reports, certifications, and other documentation to the Owner.
- E. Repeated Tests and Inspections: The Contractor shall repeat tests and inspections after each failed test until passing test results are obtained. The retesting and reinspection shall be performed at no additional cost to the Owner and the Contractor shall reimburse the Owner for their, or their representative's, time and expenses due to the failed test results.

1.06 CONTRACTOR'S RESPONSIBILITY

- A. Access. Furnish free access to various parts of the work and assist testing inspection personnel in performance of their duties at no additional cost to the Owner.

- B. Concealed Work. When directed by the Owner, the Contractor shall open for inspection any part of the work which has been concealed. Should the Contractor refuse or neglect such a request, the Owner may employ any other person to open up the same or do so himself. If any part of the work has been concealed in violation of the Owner's instruction or, if on being opened, it is found not to be in accordance with the terms of the Contract Documents the expense of opening and recovering, whether done by the Contractor or not, shall be charged to the Contractor. If the work has been concealed but not in violation of the Owner's instructions and is found to be in accordance with the terms of the Contract Documents the actual necessary expense of opening and recovering is done by the Contractor it shall be considered as extra work and paid for accordingly.
- C. Notices. The Contractor shall notify the Owner not less than 48 hours, unless otherwise noted, before work requiring inspection is started. The Contractor shall schedule portions of the work requiring inspection and testing, so that the agency's time on the project is continuous and as brief as possible.

1.07 CONSTRUCTION SURVEILLANCE BY OWNER

- A. Appointment. The Owner may appoint an on-site representative for surveillance of any and all portions of the work. Such surveillance may extend to any or all parts of the work, and to the preparation or manufacture of materials to be used.
- B. Authority of On-Site Representative.
 - 1. On-site representative is not authorized to revoke, alter, enlarge or relax the provisions of the Contract Documents, and is placed on the work site to keep the Owner informed as to the progress of the work and the manner in which it is being done.
 - 2. On-site representative may also call the attention of the Contractor to any deviations from the plans or specifications. Failure of the Owner or his representative to call the attention of the Contractor to faulty work or deviation from the Contract Documents shall not constitute acceptance of said work.
 - 3. The representative is not authorized to approve or accept any portions of the work or to issue instructions contrary to the Contract Documents.
 - 4. The representative will exercise only such additional authority as may be specially delegated to him by the Owner, notice of which will be given in writing to the Contractor.

1.08 DEFECTIVE WORK

- A. Remove and replace any work found defective or not complying with requirements of Contract Documents, at no additional cost to Owner. Work will be checked as it progresses, but failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Owner for final acceptance.

PART 2. MATERIAL (NOT USED)

PART 3. EXECUTION (NOT USED)

(Summary of Quality Control Testing Services Follows)

QUALITY CONTROL TESTING SERVICES

Services to be coordinated by the Contractor, performed by Owner's Testing Lab, and Paid by Owner/Engineer.

Special Inspections for Buildings

- Concrete Work.
- Structural Steel and Bolting, where needed.

Earthwork

- Inspect/test soils below footings for adequate subgrade bearing conditions.
- Perform sieve/proctor tests for each source of fill and native soils.
- Test in-place density of fills/backfills for buildings, pavement bases and utilities.

Concrete

- Review concrete batch tickets and verify compliance with approved mix design.
- Periodic inspection of placement of reinforcing steel.
- Continuous inspection during placement, including sampling, slump, air, temperature and taking concrete specimens.
- Continuous inspection during grouting of bolts, rebar dowels and anchors.
- Test concrete for compressive strength.

Asphalt Pavement

- Rice Density Tests. Compaction Tests. Lab: asphalt extraction/gradation.

Coating Systems

- Periodic inspection of field work.

Structural Steel

- Periodic inspection of field welding and bolted connections.

Services to be provided by the Contractor

Pipe Pressure Testing

- See Specifications

Potable Water Pipe Disinfection Testing

- See Specifications

Equipment Testing

- See Division 46 - Equipment Specifications

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

SECTION 01 50 00 – TEMPORARY FACILITIES

PART 1. GENERAL

1.01 DESCRIPTION OF SECTION

- A. The Contractor shall provide all arrangements, material and labor needed for obtaining temporary utility services.
- B. The Contractor is encouraged but not required to maintain a field office, but water and sanitation facilities must be provided for the Contractor's employees and subcontractors.
- C. Make all connections to the utility purveyor's requirements and in accordance with code requirements; remove from site upon completion of all work or when directed.
- D. Providing Temporary Facilities:
 - 1. Provide temporary construction, devices, equipment, power and convenience utilities for use, convenience and safety of personnel engaged in the work of the contract.
 - 2. Provide temporary utilities and access during construction to existing homeowners at all times.

1.02 RELATED SECTIONS

- A. Related Requirements Specified Elsewhere:
 - 1. Section 01 11 00 – Summary of Work
 - 2. Section 01 70 00 - Execution and Closeout Requirements
 - 3. Section 31 32 11 – Soil Surface Erosion Control

1.03 REGULATIONS

- A. Health and Safety: Conform with "Safety Standards for Construction Work, Chapter 296-155 WAC" by State of Washington Department of Labor and Industries.
- B. Construction Codes: Comply with regulatory construction codes as applicable.
- C. Washington State Department of Health: Comply with all applicable codes for temporary sewer and water service.

1.04 TEMPORARY FACILITIES

- A. Temporary Electrical Light & Power:
 - 1. Provide all temporary lighting and power, including pole or poles, transformer if required, for construction purposes.
 - 2. Provide temporary connections to closest utility source.
 - 3. Provide all required extension cords, lighting outlets and power outlets (grounding type), lamps, and other required equipment and accessories necessary only for adequate temporary lighting and power for construction purposes.
 - 4. Remove temporary lighting and power equipment and their connections at completion of the work or sooner if approved or directed.

B. Water for Construction Purposes:

1. The Contractor is responsible for obtaining and providing water as required for the work and for testing.
2. If agreed, Contractor to make temporary connections with metered connection with backflow preventers to utility piping as required for the work and provide meter, piping, hoses, nozzles and other accessories required.
3. At completion, or before as directed, disconnect temporary connections and piping and remove from site.
4. Provide secure system to prevent unauthorized use during Contractor's absence.

C. Sanitary Facilities:

1. The Contractor shall provide temporary restroom services at the field office location, or other centrally located site. Service may be provided by contract service. Facilities shall be regularly serviced and maintained, and kept reasonably clean. Facilities shall be promptly removed at the conclusion of the work.

D. Drinking water:

1. Provide from proven safe source, for all those connected with the work in accordance with WISHA and Health Department requirements.
2. Pipe and transport in such manner as to keep it clean and fresh; serve in single containers or provide sanitary drinking fountains.

E. Residential and Commercial Access:

1. Provide access to residential homes and commercial facilities (City Shop and Police Station) at all times.
2. Provide access to the area at all times for emergency and service vehicles.

F. Job Shack:

1. Contractor is responsible for providing a job shack, if desired.
2. Coordinate location of job shack with City.
3. Provide all utilities (power, sewer and water) as required.
4. Provide adequate parking (including import of base course, if required) and security as required.

G. Equipment Storage

1. Contractor is fully responsible for safe storage of all materials and equipment.
2. Provide all fences, gates, locks, covers, weather protection, surveillance, etc. to assure safe storage.
3. Protect all materials and equipment from the weather.

H. First Aid

1. In accordance with requirements of 296-24 WAC, furnish personnel trained in first aid and certified as approved by Washington Department of Labor and Industries.

1.05 MISCELLANEOUS PROVISIONS

- A. Cleaning Up:
 - 1. General: The Contractor and each subcontractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. Clean up work areas as required at the end of each day's work.
 - 2. Trash removal: Remove all trash and debris from site and dispose of at Contractor's expense. Allow no debris, broken or open cartons, or other refuse to collect in the project or around it; allow no inflammable or hazardous materials to be stored on the site without approved protection precautions and procedures.
 - 3. Street and parking area cleaning: Immediately clean all spilled material which results from the work of this contract and waste hauling operations; use motorized equipment and hand labor as required. Remove from streets, driveways or parking areas in time to prevent such materials from affecting traffic or clogging street drainage system; clean any drains contaminated.
- B. Noise Control: During the period of construction, provide satisfactory means, as approved by the Owner, of controlling noise originating from construction work and equipment.
- C. Dust Control: During the period of construction, provide satisfactory means of controlling dust and dirt, including application of water to control dust but not cause erosion.
- D. Temporary Erosion and Sedimentation Control: The Contractor shall provide sedimentation and erosion control in accordance with the Contract Plans and Section 31 32 11 SOIL SURFACE EROSION CONTROL in the Contract Specifications

1.06 DEBRIS CONTROL

- A. Cleaning during construction: Maintain all areas free of extraneous debris.
- B. Prevent accumulation of debris at construction site, storage and parking areas, and along access roads and haul routes.
- C. Keep storm sewers free of debris or extraneous materials.
- D. Offsite Cleanup: Prevent any leaking of materials from the vehicle used to haul offsite and clean haul routes daily.

1.07 POLLUTION CONTROL

- A. Provide all method, means and facilities required to prevent any contamination of the project site and areas adjacent to project site. Contractor will be expected to respond immediately to any spills and to take whatever measures are necessary to prevent further contamination and clean up accidental contamination. Contractor will be solely responsible for any and all costs of clean up in the event of discharge (of any kind). In the event that the Contractor is slow in responding, the Owner may elect to pay for clean-up costs directly, and all costs incurred from this, including labor, overhead, materials, management, etc., will be deducted from the next pay request.
- B. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere. Allow no discharge of noxious substances from construction operations.
- C. Provide systems for control of atmospheric pollutants in accordance with Federal/State/Local published rules and regulations.

1.08 BARRIER REQUIREMENTS

- A. During construction, the Contractor shall at all times maintain satisfactory and substantial temporary fencing, railing, barricades or steel plates at all excavations, obstructions or other hazards. All such barriers shall have warning signs or lights as necessary for safety.

PART 2. PRODUCTS (NOT USED)

PART 3. EXECUTION (NOT USED)

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

SECTION 01 60 00 – PRODUCT REQUIREMENTS

PART 1. GENERAL

1.01 DESCRIPTION OF SECTION

- A. General requirements for providing transportation, handling, storage, and protection of materials and equipment.
- B. Contractor's options in selection of products and manufacturers, and procedures for consideration of proposed substitutions.
- C. All material and equipment incorporated into the work:
 - 1. Shall be new, free from defects and of equal or superior quality as specified herein and on the drawings.
 - 2. Shall be the products of established manufacturers regularly engaged in the fabrication of such equipment.
 - 3. Shall comply with the size, type and quality specified and shall be designed for use in the particular application.
 - 4. Shall be designed, fabricated and assembled in accordance with standard engineering and shop practice.
 - 5. Shall be complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and for intended use and effect.

1.02 RELATED SECTIONS

- A. Related Requirements Specified Elsewhere:
 - 1. Section 01 30 00 - Submittals
 - 2. Section 01 45 00 - Quality Control

1.03 MANUFACTURER'S INSTRUCTIONS

- A. Installation of all materials and equipment shall comply with manufacturer's printed instructions. The Contractor shall have the responsibility to distribute copies of such instructions to all parties involved in the installation, including the Owner. One complete set of instructions shall be maintained on the job site during installation and until completion.
- B. All materials and equipment shall be handled, installed, connected, cleaned, conditioned and adjusted in strict accordance with such instructions and in conformance with the specified requirements. The Owner should be immediately notified should job conditions or specified requirements conflict with the manufacturer's instructions.

1.04 TRANSPORTATION AND HANDLING

- A. All materials and equipment shall be transported and handled in such a manner as to prevent any damage.
- B. Deliveries of products shall be in accordance with construction schedules as to cause no delay in the work or to conflict with work and conditions at the site.

- C. Products shall be delivered in the manufacturer's original containers with identifying labels intact and legible. Where materials are specified to conform to ASTM, Federal or other reference specifications, the materials shall be delivered to the site bearing the manufacturer's label stating that the materials meet the requirement of such referenced specifications.
- D. Products shall be inspected immediately upon delivery to assure compliance with specified requirements and approved submittals and that products are properly protected and undamaged.
- E. The Contractor shall provide personnel and equipment to receive and unload products delivered to the site. No products shall be delivered to the site unless such forces are available.

1.05 STORAGE AND PROTECTION

- A. Contractor is fully responsible for safe storage of all materials and equipment.
- B. All products shall be stored in strict accordance with the manufacturer's instructions, with seals and labels intact and legible.
- C. All products shall be arranged in a neat order and protected from damage from the weather, traffic and construction operations. Easy access for periodic inspection shall be provided.

1.06 PRODUCTS AND SUBSTITUTIONS

- A. Products:
 - 1. Where available, provide standard products of types which have been produced and used previously and successfully on other projects and in similar application.
 - 2. Where additional amounts of a product, by nature of its application, are likely to be needed by Owner at a later date for maintenance and repair or replacement work, provide a standard, domestically produced product which is likely to be available to Owner at such later date.
 - 3. For Products specified only by a reference standard, the Contractor may select any product meeting that standard.
 - 4. Where the make or name of a material is specified in the written documents or on the drawings, it is to establish a quality standard in that particular field of manufacture. Requests for substitutions of materials of other makes or names must be submitted to the Owner and must receive favorable written response from the Owner prior to ordering, furnishing or installing the proposed substitution item.
- B. Requests for Substitutions:
 - 1. For a period of thirty (30) days after the Contract Date, the Owner will consider written requests from the Contractor for substitution of Products.
 - 2. Requests for each Product substitution shall be submitted separately. Requests for substitutions will be received and considered when revisions to contract documents are not required, and the product or material is in keeping with the general intent of the Contract Documents.

3. A request for substitution by the Contractor constitutes a representation that the Contractor:
 - a. Will provide the same warranties or bonds for the substituted item as for the Product specified.
 - b. Will coordinate the installation of an accepted substitution into the work and make all other changes as required to make the work complete in all respects.
 4. Submit six (6) copies of requests for substitutions, fully identified for Product or method being replaced by substitution, including related specification section and drawing number(s), and fully documented to show compliance with requirements for substitutions.
 5. Include product data/drawings, description of methods, samples where applicable, Contractor's detailed comparison of significant qualities between specified item and proposed substitution, statement of effect on construction time and coordination with other affected work, cost information or proposal, and Contractor's statement to the effect that proposed substitution will result in overall work equal-to-or-better-than work originally indicated.
 6. The contractor agrees to pay all Engineering costs accruing as a result of checking and/or redesign due to substitutions. These costs will be charged to the Contractor and will be considered incidental to the contract price.
- C. Owner's Review
1. Within two weeks of receipt of request, or within one week of receipt of requested additional information or documentation (whichever is later), the Owner will notify the Contractor of either his acceptance or his rejection of the proposed substitution. Rejection will include statement of the reasons for rejection (non-compliance with the requirements for requested substitutions, or other reasons as detailed.)

PART 2. MATERIALS (NOT USED)

PART 3. EXECUTION (NOT USED)

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

SECTION 01 70 00 – EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1. GENERAL

1.01 DESCRIPTION OF SECTION

- A. Specific administrative procedures, and closeout submittals at substantial completion and at final acceptance of the work.
- B. Requirements for record documents and start-up procedures.
- C. The listing of procedures and submittals is given generally as a checklist for the Contractor's convenience. The Owner reserves the right to add to this list. This list is not an exhaustive listing of either all applicable laws or of the provisions of any law.

The Contractor shall comply with all contract requirements prior to contract closeout. Specific administrative procedures, and closeout submittals at substantial completion and at final acceptance of the work.

1.02 RELATED SECTIONS

- A. Related Requirements Specified Elsewhere:
 - 1. Section 01 33 00 – Submittal Procedures

1.03 SUBSTANTIAL COMPLETION

- A. Prior to submitting for substantial completion, the Contractor shall have:
 - 1. Delivered tools, spare parts, extra stocks of materials, and similar physical items to Owner.
 - 2. Made final changeover of locks and transmit keys to Owner.
 - 3. Completed start-up testing of systems, and performed instructions for Owner's operating/maintenance personnel. Discontinued (or change over) and removed from project site temporary facilities and services.
 - 4. Provided record information to the owner of the as-constructed facilities.
 - 5. Completed final cleaning up requirements, including but not limited to, touch-up of marred surfaces, grading, installation of handrails, etc.
 - 6. Provided O&M Manuals for all equipment, controls, telemetry and SCADA.
 - 7. Provide Compliance Documentation per 2015 Washington State Energy Code (WSEC) close out requirements per section C103.6.3 as follows:

C103.6.3 Compliance Documentation. All energy code compliance forms and calculations shall be delivered in one document to the building owner as part of the project record drawings, manuals, or as a standalone document. This document shall include the specific energy code year utilized for compliance determination for each system, NFRC certificates for the installed windows, list of total area for each NFRC certificate, the interior lighting power compliance path (building area, space by space) used to calculate the lighting power allowance. For projects complying with Section C401.2 item 1, the documentation shall include:

 - (i) The envelope insulation compliance path (prescriptive or component performance).

- (ii) The completed code compliance forms, and all compliance calculations including, but not limited to those required by section C402.1.5, C403.2.12.1, C405.4, and C405.5.
- B. When the Contractor considers the work to be substantially complete, he shall submit to the Owner:
 - 1. Written notice that the work, or designated portion thereof, is substantially complete. (The term "substantially complete" shall be defined as in accordance with the WSDOT General Specifications and Sections 00 72 00 and 00 73 00a of these documents).
 - 2. List of items to be completed or corrected and reasons for being incomplete. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents.
 - 3. Progress payment request coincident with or first following date claimed, show either 100% completion for portion of work claimed as "substantially complete", or list incomplete items and the value of the incomplete work.
 - 4. Submit statement showing accounting of changes to the Contract Sum.
 - 5. Specific warranties, workmanship/maintenance bonds, maintenance agreements, final certification and similar documents.
 - 6. Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including (where required) certificate of occupancy permits, operating certificates, and similar releases.
 - 7. Record (as-built) drawings, project manual, manual of materials, operation and maintenance manuals, and similar final record information.
- C. Upon receipt of Contractor's request, the Owner will either proceed with inspection or advise Contractor of prerequisites not fulfilled. Following initial inspection, Owner will either prepare certificate of Substantial Completion, or advise Contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form the initial "punch list" for final acceptance.
- D. When the Engineer, on the basis of an inspection, concurs that the work is substantially complete, he will:
 - 1. Prepare and deliver to the Contractor a certificate of Substantial Completion accompanied by the Contractor's list of items to be completed or corrected. The Certificate of Substantial Completion shall state the responsibilities of the Contractor for security, maintenance, heat, damages to the work and insurance and shall fix the time within which the Contractor shall complete the items listed therein. Warranties and guarantees required by the Contract Documents shall commence on the Date of Substantial Completion.
 - 2. The Certificate of Substantial Completion is submitted to the Contractor for their written acceptance of their responsibilities as stated therein.

1.04 FINAL INSPECTION

- A. When the Contractor considers the work to be complete, he shall submit written notice to the Owner that the work has been completed and inspected in compliance with the Contract Documents including punchlist items, and equipment and systems have been tested and are operational; and requesting a contract completion inspection.

- B. When the Engineer, on the basis of an inspection, concurs that the work is acceptable under the Contract Documents, he will notify the Contractor in writing and request the Contractor to provide remaining submittals.
- C. Should the Engineer determine that the work is not acceptable under the Contract Documents:
 - 1. The Engineer will promptly notify the Contractor in writing giving the reasons therefor.
 - 2. The Contractor shall remedy the deficiencies in the work and submit a new written notice for final inspection to the Owner.

1.05 FINAL PAYMENT

- A. When the Contractor has satisfied all requirements of this section and all other conditions of the Contract Documents, the Contractor may submit a final Application for Payment. Should the Owner determine the Work acceptable under the Contract Documents and the Agreement fully performed, he will promptly issue a final Certificate for Payment stating that to the best of his knowledge, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance due the Contractor, and as noted in the final certificate, is due and payable.
- B. The accumulated retainage shall not be paid until the Contractor submits to the Owner:
 - 1. Affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the Owner might in any way be responsible, have been paid or otherwise settled.
 - 2. Release of Lien. One will be required from each lien holder who has duly filed a notice of claim with the Owner. If any liens remain unsatisfied after the expiration of the statutory lien period, the Contractor shall refund the Owner all amounts that the Owner may be compelled to pay in discharging such lien including all costs and reasonable attorney's fees.
 - 3. State Department of Revenue form that all taxes have been paid.
 - 4. State Department of Labor and Industry affidavit of wages paid.
 - 5. State Department of Employment Security Contractor release.
- C. The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:
 - 1. Unsettled liens or disputes.
 - 2. Faulty or defective work appearing after Substantial Completion under the project guarantee and equipment warranty period.
 - 3. Failure of the work to comply with the requirements of the Contract Documents.
 - 4. Terms of any special warranties required by the Contract Documents.

The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.

1.06 FIELD TESTS AND ADJUSTMENTS

- A. All mechanical and electrical equipment, as required under the separate section headings, 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 and connected. Any changes, adjustments or replacements required to make the equipment operate as specified shall be performed by the Contractor as part of the Work.

- B. At least 14 days before the time allowed in the construction schedule for commencing testing and start-up procedures, the Contractor shall submit to the Engineer details of the procedure proposed for testing and start-up of all mechanical and electrical equipment, except when such procedures have been covered in the specifications.
- C. The Contractor's testing and start-up procedures shall include detailed descriptions of all preoperational electrical, mechanical and instrumentation testing work. Each control device, item of mechanical, electrical and instrumentation equipment, and all control circuits shall be considered in the testing procedures, which shall be designed, in a stepwise, logical sequence to ensure that all equipment has been properly serviced, aligned, connected, calibrated and adjusted prior to operation. The Contractor is advised that failure to observe these precautions may place the acceptability of the subject equipment in question, and he may either be required to demonstrate that the equipment has not been damaged, or replace it as determined by the Engineer. Testing procedures shall be designed to duplicate as nearly as possible all conditions of operations, and shall be carefully selected to ensure that the equipment is not damaged. Once the testing procedures have been accepted by the Engineer, the Contractor shall produce checkout, alignment and adjustment, and calibration sign-off forms for each item of equipment, which shall be used in the field by the Contractor and the Engineer jointly, to ensure that each item has been properly installed and tested. All testing must be performed in the presence of the Engineer.
- D. During the testing of the mechanical, instrumentation and electrical equipment, the Contractor shall make available, as necessary, representatives of the manufacturers of all the various pieces of equipment, or other qualified persons, who shall instruct the Owner's personnel in the operation and care thereof. Instructions shall include written step-by-step operation and trouble-shooting procedures with a complete description of all necessary test equipment and all protective device settings. Upon completion of testing, the manufacturer's representative shall provide the Engineer with a letter stating that the specific piece of equipment has been properly installed and tested and will satisfy the requirements of the Contract Documents.

1.07 RECORD (AS-BUILT) DRAWING INFORMATION

- A. During the construction period, the Contractor shall maintain a complete set of prints for the sole purpose of maintaining a day-by-day record of installed information. This information shall include, but not limited to: the size and location of all concealed or underground piping, conduit, and ductwork; all approved deviations from the specifications and drawings; the location of any visible objects relocated due to interferences or requested relocations submitted and approved on shop drawings. Such relocations shall be dimensioned.
- B. Addenda, bulletins, field orders, and change orders shall be posted and referenced in the record set of prints.

1.08 RECORD PROJECT MANUALS

- A. Maintain one copy of the Contract Documents, including addenda, change orders and similar modifications issued in printed form during construction, and mark-up variations (of substance) in actual work in comparison with text of the Project Manual and modifications as issued.
- B. Give particular attention to substitutions, selection of options, and similar information on

work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Not related record drawing information and product data, where applicable.

1.09 MISCELLANEOUS RECORD SUBMITTALS

- A. Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to Engineer for Owner's records.

1.010 FINAL CLEAN-UP

- A. At the completion of the work, the Contractor shall leave the premises in a neat and unobstructed condition, ready for Owner occupancy. The buildings shall be left in a dust free condition and all equipment and materials in perfect repair and adjustment.
- B. After all trades have completed their work and just before final acceptance and occupancy by owner, thoroughly clean all surfaces of project. Clean lighting fixtures and electrical equipment, including washing and polishing lenses inside and out. Wash and polish all exposed metal surfaces. Broom clean exterior paved areas and rake clear other surfaces of the grounds. All waste building materials, pipe, etc. shall be removed from the site and disposed of.

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

SECTION 01 91 00 – COMMISSIONING

PART 1. GENERAL

1.01 GENERAL

- A. Related Requirements Specified Elsewhere:
 - 1. Section 01 33 00 – Submittals Procedure
 - 2. Section 01 70 00 – Execution and Closeout Requirements
- B. Description of Section:
 - 1. Specific commissioning procedures and start-up requirements.
 - 2. Requirements for equipment settings and field verification.
 - 3. The listing of procedures and field tests is given generally as a checklist for the Contractor's convenience. The Owner reserves the right to add to this list. This list is not an exhaustive listing of all applicable settings and requirements to achieve specified results.
 - 4. The Contractor shall comply with all contract requirements prior to contract closeout. Specific administrative procedures, and closeout submittals at substantial completion and at final acceptance of the work.

1.02 COMMISSIONING TEMPORARY WELL PUMP EQUIPMENT:

- A. The well pump equipment supplier is to provide a minimum of one (1) day of start-up supervision and operator training. Supervision and training duties to include the following:
 - 1. Inspect installation for concurrence to design
 - 2. Check the amperage draw from the pump
 - 3. Make sure equipment is installed to allow easy access.
 - 4. Verify flow and control set points match design.
 - 5. Make sure all operations of the controls, including submersible transducer, pressure transducers, and pressure switch are working properly.
 - 6. Review Operation and Maintenance Manual with personnel
 - 7. Demonstration and Training on controls

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

SECTION 02 09 20 – LANDSCAPING

PART 1. GENERAL

1.01 DESCRIPTION OF WORK

- A. Work in this section shall include all labor, equipment and materials necessary for re-establishing grass vegetation in areas disturbed during construction and as indicated on the drawings. Work shall include stripping, excavation, hauling, stockpiling, placing topsoil, placing compost, and hydro-seeding.

1.02 RELATED SPECIFICATIONS

- A. Section 31 20 00 – Earthwork
- B. Section 31 32 11 – Soil Surface Erosion Control

1.03 SEEDING GUARANTEE

- A. During the one (1) year guarantee period should any seeded area show signs of failure such as dead or dying areas of grass, bare spots, dead or dying plants, etc., the Contractor shall repair or replace all deficient items to the satisfaction of the Engineer.
- B. All graded areas not seeded or paved shall be covered with two (2) inch depth straw to prevent erosion. Straw to be provided and installed by the Contractor. Do not perform planting or seeding when ground is frozen, snow covered, muddy or in an otherwise unsatisfactory condition. When unforeseen conditions detrimental to plant growth are encountered, such as adverse drainage conditions, obstructions, compaction, or toxified soils, notify the Engineer before proceeding.

1.04 SUBMITTALS

- A. The Contractor shall submit product specifications and installation recommendations for all materials to be provided under this section.
- B. Submit seed vendor's blue tag certification for required grass seed mixture, indicating percentage by weight, and percentages of purity, germination, and weed seed for each grass species.
- C. Upon seeded areas acceptance, submit written maintenance instructions recommending procedures for maintenance of seeded areas.

PART 2. PRODUCTS

2.01 TOPSOIL MATERIAL

- A. Topsoil shall conform to Section 9.14.1(2) of the Standard Specifications.

2.02 GRASS SEED

- A. Seed shall conform to Table 1 below. Seed of the following composition, proportion, and quality shall be applied at a rate of 8 pounds per 1000 square feet:

Table 1	
Common Name	% by Weight
Blazer 4 Perennial Ryegrass	30
Express II Perennial Ryegrass	30
Windward Chewings Fescue	20
Garnet Creeping Red Fescue	20

This mixture is provided by Sunmark Seeds under the name DOT Multipurpose Mixture. Seeds shall be certified "Weed Free" indicating there are no noxious or nuisance weeds in the seed.

2.03 FERTILIZER

- A. Fertilizer shall be a granular, non-burning product composed of not less than 50% organic, slow acting, guaranteed analysis professional fertilizer. Seeded area starter fertilizer containing 20% nitrogen, 26% phosphoric acid, and 6% potash by weight, or similar approved composition applied at a rate of 6.5 lbs/1000 SF.

2.04 WOOD FIBER MULCH FOR HYDRO-SEEDING

- A. Hydro-seeding to be applied to all areas disturbed and/or regraded (which will not be protected with quarry spalls, gravel, and/or pavement) during construction. Commercially prepared wood fiber mulch specifically manufactured for hydro-seeding application shall be used.
- B. Dispersing agents may be added at Contractor's option provided that the additive is not harmful to the mixture.

2.05 WATER

- A. The Contractor shall furnish water as required for planting and establishing vegetation in seeded areas. Provide all necessary hoses, equipment, attachments, and accessories for adequate watering of seeded areas.

PART 3. EXECUTION

3.01 GENERAL

- A. The Contractor shall notify the Engineer 48 hours in advance of hydroseeding operations and shall not begin the work until areas prepared or designated for seeding have been approved.
- B. Hydroseed all planting areas and disturbed areas as shown in the plans. All planting areas shall receive upland seed mix.
- C. Disturbed areas where hydroseeding is impractical may be seeded by hand with Engineer approval. When hand seeding, the seed shall be incorporated into the top 1/4" of soil by hand raking or other method approved by the engineer.
- D. Protect seed during germination in conformance with the Standard Specifications, Section 8-02.3(15)G.

3.02 SEEDING

- A. Inspect all subgrades for debris and adverse drainage conditions. Remove all debris including rocks 1-inch in diameter and larger, sticks, roots, sod and other deleterious material. Notify the Owner of any grades or conditions which might create adverse or undesirable drainage patterns.

- B. Smoothly blend and feather topsoil into existing surrounding grades. Rake or lightly harrow topsoil until the soil is friable and of uniform texture and satisfactory for seed placement.
- C. After seeding, topsoil shall be rolled for compaction and shall be minus ½-inch below all adjacent paved or graveled surfaces. Irrigate immediately until soil is damp to about 6".
- D. The hydro-seeding operation shall include the installation of seed, fertilizer, mulch, and tackifier with a tracer to verify uniform application.
- E. Hydro-seeding shall be done in accordance with WSDOT Spec. 8-01.3(2)B.
- F. Seed immediately after preparation of seed bed.
- G. Seed shall be applied at a rate listed above.
- H. Mulch shall be applied at a rate of 2,000 pounds per acre.

3.03 MAINTENANCE AND WATERING

- A. Water regularly until germination is consistent and the seedlings are averaging 1" in height, then reduce to less frequent intervals (but maintain appropriate soil moisture to ensure proper growth).
- B. Re-seed, approximately 21 days after germination, any barren area 12" in diameter or larger, at the specified application rate. In the event of unusual weather, over-seed when weather conditions are suitable for germination, at rate determined by Engineer (not to exceed original rate.)
- C. Apply fertilizer rate as follows: first application not earlier than 4 weeks, but not to exceed 6 weeks after installation; second application 4-6 weeks after first application, but not to exceed 10 weeks after installation.
- D. Patch, repair and re-seed any and all damaged or barren areas observed prior to final project acceptance at no additional cost to the Owner.
- E. The Contractor shall protect and care for all seeded areas until fully established and hearty. Care shall include equipment and labor necessary to provide sufficient and continuous watering of all seeded areas until final acceptance.

3.04 FINAL ACCEPTANCE

- A. Final acceptance of seeded areas shall be based on a uniform stand of grass free of weeds, pests, and diseases as determined by Engineer.

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

SECTION 02 41 00 - DEMOLITION

PART 1. GENERAL

1.01 DESCRIPTION

- A. Related Work Specified Elsewhere
 - 1. Scopes of Bids: Section 00 24 13
 - 2. Summary of Work: Section 01 11 00
- B. Description of System: The work covered by this section includes the furnishing of all labor, equipment, and materials necessary for the demolition, removal, rehabilitation and equipment salvage of all construction as specified herein and as shown on the drawings.

1.02 JOB CONDITIONS

- A. All removed equipment, materials, and debris, unless otherwise noted or requested by the Owner, shall become the property of the Contractor. The Contractor shall deliver all items to be salvaged (as directed by the Owner), to the storage area designated by the Owner.
- B. Protection: Ensure the safe passage of persons around the area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and people and livestock.

PART 2. PRODUCTS

Not Used.

PART 3. EXECUTION

3.01 DEMOLITION

- A. Pollution Controls:
 - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level.
 - 2. Comply with governing regulations pertaining to environmental protection.
- B. Removal Requirements:
 - 1. Provide complete removal and disposal of all structures identified for demolition. All pipes connected to abandoned structures are to be plugged/grouted in an approved manner, preventing any potential water and/or sewer leaks. Salvage items as directed by the Owner.
 - 2. Proposed equipment is to be purchased and on-hand, prior to removal of specified structures. Contractor is to coordinate removal/demolition with Owner's staff (a minimum of 2 week) prior to all removal/demolition work.
- C. Structures to be Removed (Demolished):
 - 1. Existing generator, existing 10 HP well pump/motor, existing ecology blocks adjacent to wellhouse and associated structures.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

- A. General. Remove from the site debris, rubbish, and other materials resulting from demolition operations. Burning of removed materials from demolished structures will not be permitted on the site. Comply with all federal, state and local regulations regarding hauling and disposal.
- B. Removal. Transport materials removed from demolished structures and dispose of at a legal disposal site.

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

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1. GENERAL

1.01 DESCRIPTION

- A. Work includes but is not limited to the following:
 - 1. All material, labor, and equipment to prepare subgrade, build forms, install rebar, and place concrete for all cast-in-place concrete shown on the Plans. Compensation for all costs associated with cast-in-place concrete shall be incidental to the lump sum bid items in which the work is identified.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
 - 1. Section 32 20 00 Earthwork

1.03 EXTRA WORK ITEMS (written authorization required)

- A. Overexcavation. See Section 31 20 00 Earth Moving.
- B. Structural Fill. See Section 31 20 00 Earth Moving.

1.04 REGULATORY REQUIREMENTS

- A. Comply with the requirements of Section 01 41 00 REGULATORY REQUIREMENTS, and the following. Note that where conflicts may arise, comply with the most stringent requirement:
 - 1. WSDOT *Standard Specifications for Road, Bridge and Municipal Construction*, M41-10, 2012 Edition.
 - 2. Washington State Department of Ecology, *Stormwater Management Manual for Western Washington*, August 2012.
 - 3. Codes and Standards listed in Section 1.05 below are incorporated as regulatory requirements by reference.

1.05 CODES AND STANDARDS

- A. Comply with the Drawing Structural Notes, they are part of the contract documents and take precedence over less specific requirements in these specifications.
- B. American Concrete Institute (ACI)
 - 1. *ACI-301-16 – Specifications for Structural Concrete*
 - 2. *ACI-318-14 – Building Code Requirements for Structural Concrete*
 - 3. *ACI-117-10 – Specification for Tolerances for Concrete Construction*
 - 4. *ACI-347-04 – Recommended Practice for Concrete Formwork*
 - 5. *ACI-350R-06 – Requirements for Environmental Engineering Concrete Structures*
 - 6. *ACI-SP-066-04 – ACI Detailing Manual*
 - 7. *ACI-305.1-14 – Specification for Hot Weather Concreting*
 - 8. *ACI-306.1-90 – Standard Specification for Cold Weather Concreting (Reapproved 2002)*

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- C. Concrete Reinforcing Steel Institute (CRSI), *Manual of Standard Practice*, 27th Edition.
- D. International Code Council, *International Building Code*, 2016.

1.06 SUBMITTALS

- A. Submit shop drawings that conform to ACI-SP-066-04 detailing standards. Failure to conform to ACI detailing standards may constitute grounds for rejection without review, with resubmittal required.
- B. Submit mix design, to meet criteria per the Structural Notes.
- C. Material Certificates: Signed by manufacturer and Contractor; Submit in lieu of laboratory test reports as acceptable to Engineer, demonstrate compliance with requirements.
 - 1. Certification of admixtures compatibility by Contractor's approved technician.
- D. Mix Design: Written proposal for each concrete mix to meet criteria per the Structural Notes. Submit each design a minimum 15 working days prior to start of Work that includes the mix. Each mix design shall include following:
 - 1. All materials and admixtures and their proportions.
 - 2. Water-cement ratio, slump, aggregate grading, and maximum aggregate size.
 - 3. Evidence that mix design meets the strength requirements and other requirements. Compression and other test data (field experience method) or results of testing (trial batch method) used to establish mix proportions.
 - 4. State (WSDOT) materials sources for principal constituents, including cement and aggregate.
 - 5. Certificates signed by manufacturer and Contractor stating compatibility of admixtures
- E. The contractor shall submit a detailed plan for dealing with hot and cold weather work, prepared by a registered Professional Engineer. The plan shall be subject to review by the Engineer of Record. ACI 305 and 306 shall be the basis of the plan. At a minimum, the plan shall include
 - 1. Protect concrete with curing blankets or by other means for a minimum of 72 hours when temperatures are expected to be below 38 degrees F for more than 3 hours. The plan shall include specific measures for securing the protection against wind, rain, snow, or other inclement weather.
 - 2. When temperatures are expected to be above 85 degrees F for more than 12 hours, use curing compound or continuous wetting techniques to reduce cracking. The plan shall include specific measures dealing with hot, sunny, and windy weather.
- F. The contractor shall submit plans and calculations for formwork necessary at the Clarifier structures, sealed by a Washington State Structural Engineer. These shall comply to ACI 347R-14, Guide to Formwork for Concrete. The submittal of these documents is intended to show good faith in planning and execution of the work. It does not relieve the contractor of its responsibility for diligent and safe prosecution of the work at all times.
- G. The contractor shall submit plans indicating locations and types of all proposed construction, control and expansion joints. Spacing shall not exceed the maximum allowable spacing indicated on the plans. If control joint spacing limits are not indicated

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

on the plans, control joint spacing shall not exceed 30 times the slab thickness unless approved in writing by the Engineer of Record.

1.07 QUALITY ASSURANCE

- A. Regulatory Requirements: See referenced Codes, ordinances and the like as well as Section 01 45 00 QUALITY CONTROL.
- B. Testing and Inspection. Owner will provide independent testing and inspection outside of the contract. Contractor shall coordinate and cooperate with Owner's independent testing and inspection agency. The Contractor shall give adequate notice of upcoming work to the testing agency and/or the on-site agent of the Engineer of Record. Owner's independent testing and inspection agency will perform the following tasks:
 - 1. Compaction and Moisture Control Tests on foundation subgrade prior to placement reinforcing.
 - 2. Reinforcing placement, lap length, cover, and bar sizes, concrete placement taking of test cylinders, and cylinder testing.

1.08 PROJECT SITE CONDITIONS

- A. Coordination: Notify the Engineer upon completion of preparatory work and of intended schedule for placement.
- B. Establish and maintain required lines and elevations.

PART 2. PRODUCTS

2.01 GENERAL

- A. Comply with "Quality Assurance" provisions, "References," and Specifications. Where these may be in conflict, the more specific requirements govern.
- B. All products to be installed in accordance with "Quality Assurance" provisions, "References," Specifications, and Manufacturer's directions. Where these may be in conflict, the more specific requirements govern.

2.02 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints. Applies to slabs and interior exposed concrete wall conditions and raised concrete stem walls.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit. Applies to concrete surface conditions hidden below grade.
- C. Form Liner Finish Concrete: Coordinate with drawings for locations, and Section 3.02 for installation requirements.

2.03 STEEL REINFORCEMENT

- A. See the Structural Notes and the Structural Drawings for reinforcing materials.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of

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Standard Practice."

2.04 CAST-IN-PLACE CONCRETE MATERIALS

- A. Aggregates: All aggregates shall be from Washington Department of Transportation approved sources, and shall be free from marine life shells and residues of salt.
- B. Concrete: Mix design shall be per the Structural Notes (per Section 1.06, Submittals).
- C. Reinforcing steel shall be as per the Structural Notes.
- D. Joint Sealant. Joint Sealant shall be GREY IN COLOR approximating matching color of concrete and meet WSDOT Standard Specification 9-04.2.
- E. Premolded Joint Filler for Expansion Joints. Pro-Flex manufactured by Oscoda, or approved; 100 percent recycled vinyl.
- F. Waterstop Hydrophilic bentonite or modified chloroprene rubber; Cetco Waterstop – RX101T Greenstreak Hydrotite CJ0725, or equal. Maintain 3" minimum cover from face of waterstop to face of concrete. Remove all dirt, coatings, and debris from concrete surface. Install waterstop per manufacturer's instructions.
- G. Adhesive Doweling Accessories Accepted products shall be as stated in the Structural Notes in the Contract Plans.

2.05 MOISTURE RETARDERS FOR INTERIOR SLABS-ON-GRADE

- A. A. Sheet Vapor Retarder: ASTM E 1745, Class. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Stegowrap Vapor Barrier, 15 mil sheeting and associated tape and accessories for complete installation.

2.06 CURING MATERIALS FOR INTERIOR SLABS-ON-GRADE

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.07 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

PART 3. EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes

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acceptance of conditions as satisfactory.

- B. Follow the plan for hot and cold weather work per Section 1.06.
 - 1. The Owner shall have authority to require such protections based on National Weather Service hourly forecasts.

3.02 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork of well-fitted, strong, rigid, and leak-proof materials so bulges, fins, or voids are not created in the finished work, and concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.03 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.04 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 2. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.05 STEEL REINFORCEMENT INSTALLATION

- A. Bar detailing not shown otherwise on drawings shall comply with the CRSI Manual of Standard Practice.
- B. Lap all bars 40 diameters unless shown otherwise on the drawings. Bars parallel to the line of the wall shall be continuous, i.e. lapped or with corner "L" bar laps, or otherwise terminated at the ends of the wall with 90-degree x 12 bar diameter hooks.
- C. Support reinforcing bars on chairs or other purpose-made devices so that they are securely held in place and maintain tolerances during placement and consolidation of concrete. Pulling up reinforcing to "float" in slabs as concrete is placed is unacceptable, and any such work is subject to rejection, demolition, and rework.

3.06 JOINTS IN BUILDING SLABS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect or Engineer of Record.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

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1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.07 CONCRETE PLACEMENT

- A. All work associated with the manufacture, transport, and placement of concrete shall comply with References listed in parts 1.04 and 1.05 of this specification section.
1. Contractor to plan for and accommodate any embedded items such as wall pipe, railings, ladders, hatches etc. which are not or may not be suitable for subsequent installation into cured concrete.
 2. This plant is designed for a long service life with a minimum of maintenance. Penetrations of concrete walls or slabs require prior approval to core drill through. It is the responsibility of the contractor to coordinate work and provide sleeves as required. Failure in coordination of piping with concrete work may result in rejection of work to be demolished and redone at no cost to the Owner.
- B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.08 FINISHING FORMED SURFACES

- A. General: Vibrate to compact, screed, level, and tamp with a grid tamper to raise a thin mortar bed to the surface. Trowel after concrete has hardened sufficiently to prevent drawing moisture to the surface. Do not dust with dry materials.
- B. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie-holes, defects, and depressions 1/16-inch or larger in depth or width repaired and filled with mortar. The mortar shall consist of 1 part cement and 1-1/2 parts fine (passing No. 100 screen) mixed with enough water and an emulsified bonding agent to have the consistency of a thick cream. The surfaces shall be brush sandblasted prior to filling holes to expose all holes near the surface. Thoroughly wet surfaces and rub mortar on with burlap, sponge rubber floats, or trowels while surface is damp. Wipe surface clean and moist cure. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

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- C. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Tie-holes, defects, and depressions 1/16-inch or larger in depth or width repaired and filled with mortar. The mortar shall consist of 1 part cement and 1-1/2 parts fine (passing No. 100 screen) mixed with enough water and an emulsified bonding agent to have the consistency of a thick cream. The surfaces shall be brush sandblasted prior to filling holes to expose all holes near the surface. Thoroughly wet surfaces and rub mortar on with burlap, sponge rubber floats, or trowels while surface is damp. Wipe surface clean and moist cure. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view.
- D. Form Liner Finish: As cast texture imparted by reusable Form Liners with a minimum of joints.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- F. Sandblast: Provide light sand blasted finish at non-form liner wall finishes at exterior ramp walls.

3.09 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces.
 - 1. Interior Floor Slabs: Steel trowel and install joints straight and true. Do not apply curing compounds. Damp cure only. Slope concrete slabs with Portland Cement Grout 1/8" per foot to sumps or as indicated on plans. Apply slip-resistant rake finish to wetwell bottoms.
 - 2. Sidewalks, Exterior Slabs on Grade and Curbs: Steel trowel and medium broom finish.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated, including entire interior slab at UV/maintenance shop building, and at mudroom and at Lab Building.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

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3.010 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. All structural concrete shall be moist cured for a minimum of 90 days, unless otherwise instructed by Engineer.
 - 2. Moisture Curing
 - a. Building Slabs: Keep surfaces continuously moist for a minimum of seven (7) days.
 - 3. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Curing for Building Slabs: Cure for a minimum of seven (7) days.
 - 4. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal where floor coverings will be installed: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 - 5. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.011 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when directed by Engineer of Record (EOR). Remove and replace concrete that cannot be repaired and patched to EOR's approval.

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3.012 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

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

SECTION 04 20 00 - MASONRY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry joint reinforcement.
 - 5. Miscellaneous masonry accessories.
- B. Related Sections:
 - 1. Section 03 30 00 "Cast-in-Place Concrete"
 - 2. Section 05 50 00 "Metal Fabrications"
 - 3. Section 07 19 10 "Water Repellents" for water repellents applied to unit masonry.
 - 4. Section 09 90 00 "Painting" for painting applied to unit masonry.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells. Note that all unit masonry to be built on this job shall be reinforced and all cells grouted solid.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days, per the Structural Notes.

1.5 ACTION SUBMITTALS

- A. Shop Drawings: For the following:

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1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes. All units shall be split block, with one side (inside) smooth faced, as well as all edges smooth faced.
2. Trim Units: Show sizes, profiles, and locations of each trim unit required, including window sill blocks as shown on the drawings.
3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement" Show elevations of reinforced walls.
4. Fabricated Flashing: Detail where required for weathertightness.

B. Samples for Initial Selection:

1. Split-face CMU, flat one sided (inside) and rough one side (outside) with flat ends.
2. Submit samples for approval of texture and color per City of Ferndale.

C. Material Certificates: For each type and size of the following:

1. Masonry units.
 - a. For masonry units, include data and calculations establishing average net-area compressive strength of units.
2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

Mix Designs: For each type of mortar and grout, include description of type and proportions of ingredients.

8. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

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- 9. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- E. Cold-and-Hot weather procedures: Per IBC requirements, including referenced standards.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

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- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in the IBC, including referenced standards.

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PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, sills, bonding, and other special conditions.

2.3 MORTAR AND GROUT MATERIALS

- A. See the Structural Notes and 2.6 below.

2.4 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60.

2.5 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.6 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Type N, comply with ASTM C 270.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color to match block. Do not add pigments to colored cement product.
 1. Pigments shall not exceed 10 percent of portland cement by weight.
 2. Pigments shall not exceed 5 percent of masonry cement by weight.
 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. CMUs on laboratory and blower building.
- E. Grout for Unit Masonry: Comply with ASTM C 476 and the Structural Notes.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- D. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.

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3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.

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4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. (Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.)
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond, typically by one half block width. Minimum running bond shall be not less than 4-inches. Bond and interlock each course at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.

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4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
 1. Where epoxy-mortar pointed joints are indicated, rake out setting mortar to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

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- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (12.67 ft.)

3.7 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to the International Building Code.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

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3.8 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

SECTION 04 20 00 - MASONRY

3.9 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of approved specified fill material for each part of masonry waste.
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

*** End of Section ***

SECTION 05 12 00 – STRUCTURAL STEEL

PART 1. GENERAL

1.01 DESCRIPTION

- A. The requirements of this section consist of furnishing, fabricating, and erecting structural steel as shown on the Drawings. All steel in the work except for “miscellaneous” items covered by Section 05 50 00 is included in the requirements of this Section.

1.02 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.03 SUBMITTALS

- A. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard American Welding Society (AWS) symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
- B. Welder's Certificates: Supply Washington Association of Building Officials (WABO) welder certificates per the Structural Notes.
- C. Certificates and Material Reports: Signed by manufacturers certifying that the following products comply with requirements:
 - 1. Welding rod.
 - 2. Bolts, nuts, and washers.

1.04 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design"
 - 3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

SECTION 05 12 00 – STRUCTURAL STEEL

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.06 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2. PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

- A. See the Structural Notes and drawings for ASTM requirements for members, bolts, nuts, washers, connectors, and anchors.
- B. Threaded Rods: Conform to ASTM A 36.

2.02 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.03 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. All full-penetration welds shall be made in the shop. (Note: This does not apply to weld-splicing of piles, which shall be made in the field – piles are not covered in this section of the Specifications.) Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings-- Allowable Stress Design and Plastic Design."
 - 1. Camber structural-steel members only where indicated.
 - 2. Mark and match-mark materials for field assembly.
 - 3. Complete structural-steel assemblies, including welding of units, before starting galvanizing or corrosion protection operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Do not thermally cut or enlarge holes at any place in the work, in the shop or in the field. Work with thermally cut or enlarged holes will be rejected.

SECTION 05 12 00 – STRUCTURAL STEEL

- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning, except surfaces to be mated to zinc-anti-corrosion blocks, which shall be cleaned according to SSPC-SP 3, "Power Tool Cleaning."
- F. Welded Headed Studs: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

2.04 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified for A572 or A36 members. For stainless steel members, use type 304, A193 grade B8.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

2.05 PAINTING

- A. The steel is not to be primed or painted except as may be noted. Some steel will be stainless, other members may be galvanized where called out on the drawings.

2.06 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123 to steel indicated on the drawings.

PART 3. EXECUTION

3.01 EXAMINATION

- A. Verify elevations of bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

SECTION 05 12 00 – STRUCTURAL STEEL

- B. Base and Bearing Plates: Clean concrete surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of base plate.
 - 3. Snug-tighten anchor rods or bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges," except as noted. Note: It is anticipated that the piles may not align properly with the pilasters, so stringer-support-beams may not be perpendicular to stringers. This aspect of construction has been anticipated in the design. Do not fabricate the 1 inch diameter lateral bracing rods / turnbuckles until after the stringers have been installed, so that proper lengths of the rods that will be required may be verified in the field.
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated. Stringer to stringer splices shall be bolted (as shown on the drawings), not welded.
- F. Do not use thermal cutting during erection unless specifically noted on the drawings or approved by the Contracting Officer. Finish thermally cut sections within smoothness limits in AWS D1.1.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

SECTION 05 12 00 – STRUCTURAL STEEL

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, and alignment.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: The Government will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 1. In addition to visual inspection, field welds may be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Correct deficiencies in work that test reports and inspections indicate does not comply with the Contract Documents, at no additional cost to the Government.

3.06 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Lubricate hinges on bull rail to prevent corrosion with an environmentally appropriate lubricant approved by the Contracting Officer.

*** END OF SECTION ***

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work consists of furnishing labor, materials and equipment for the fabrication and erection of metal fabrications shown which are not part of structural steel or other metal systems specified in this document. The Section includes embedded and nonembedded metal work, aluminum shapes, clip angles, rungs, tubing, rods guides, inserts, brackets, anchor bolts, beams, bracing, and similar items.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. A 36 - "Specification for Structural Steel."
 - 2. A 153 - "Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware."
 - 3. A 307 - "Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile."
 - 4. A 312 – "Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes"
 - 5. B 6 - "Specification for Zinc (Slab Zinc)."
- B. American Welding Society (AWS).
 - 1. D1.1 - "Structural Welding Code."
- C. Steel Structures Painting Council (SSPC).
 - 1. "Painting Manual."

1.3 SUBMITTALS

- A. Shop Drawings for all fabricated items including all connections, field joints, and finishes.
- B. Welder's licenses

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Metal Fabrications: Meet applicable requirements of IBC Chapter 22.

SECTION 05 50 00 – METAL FABRICATIONS

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel and iron

1. Steel shapes, plates and bars: Per Structural Notes.
2. Steel pipe: ASTM A 53, Schedule 40 unless indicated otherwise.
3. Steel tubing: Square or rectangular: ASTM A 500 Grade B, welded and seamless, unless noted otherwise on drawings.
4. Steel sheet: ASTM A 366 if not galvanized, ASTM A 526 if galvanized.

B. Aluminum

1. Pipe railings, sleeves and balusters: ASTM B 429, Schedule 40 and 80 pipe, alloy 6061 -T6, finish AAM32.
2. Pipe railing sleeve flange: ASTM B 209 alloy 6061-T6 finish AAM32.
3. Extruded structural shapes and tread supports: ASTM B 308 alloy 6061-T6, null finish.
4. Fabrication Weld balusters to railings.

C. Stainless steel: ASTM Type 304 and Type 316.

D. Galvanizing

1. Where items are called to be galvanized, galvanize by the hot-dip process in conformance with ASTM A 123, A 153, and A 525. Two ounces/square foot minimum.

2.2 FASTENERS

A. Metal to metal:

1. Steel to steel: ASTM A 307, Grade A, hex head, galvanized unless neither steel item is galvanized.
2. Aluminum to aluminum: ASTM F 593, Type 304 stainless steel.
3. Other: Stainless steel; ASTM F 593, Type 304.

SECTION 05 50 00 – METAL FABRICATIONS

B. Metal to concrete:

1. Mechanical Anchors

For use on non-water bearing concrete structures only, such as building slab and concrete walkway locations. Locations to be approved by Engineer:

- a. Expansion bolts: Federal Specification FF-S-325, stainless steel, group and type as appropriate, loading not to exceed 25% of specified "Proof test" load; Phillips Redhead "parabolt concrete anchors" or equal.

2. Chemical Anchors (Note: Use typically except as noted above)

- a. See Structural Notes.

C. Metal to wood:

1. Bolts: ASTM A 307, Grade A, hex head, hot-dip galvanized, except stainless steel where noted on Drawings.

2. Lag screws: Square head type, Federal specification FFB-561, zinc coated for steel, stainless steel for all other.

3. Metal to hollow construction: Toggle bolts, Federal Specification FF-B-588, zinc-coated (galvanized).

D. Powder-actuated fasteners: Use for fastening as called out on drawings, size as recommended by manufacturer, stainless steel material.

E. Washers: Provide washers of the same material and finish as the bolt, under all nuts, and under the heads of A325 or A490 bolts.

F. Lock washers: Provide spring steel helical lock washers of the same finish as the bolt under nuts and bolt heads of connections subject to vibration.

G. Nuts: Nuts shall conform to the recommendation of the applicable bolt specification and shall be of the same material as the bolt.

2.3 WELDING

- A. Perform welding in accordance with pertinent recommendations of the American Welding Society. Use electrodes and methods recommended by manufacturer of material being welded. Type, size and spacing of welds in accordance with reviewed Shop Drawings.

SECTION 05 50 00 – METAL FABRICATIONS

1. Welding shall be done by operators who are State-licensed. The quality of welding shall conform to AWS "Code for Arc Welding in Building Construction," Section 4 Workmanship.
 - B. Welds behind finished surfaces: Use methods to minimize distortion and discoloration of finished surface.
 - C. Remove flux and slag from both sides of welds.
 - D. Grind accessible welds smooth.
 - E. Complete welding before galvanizing, anodizing or painting.
- 2.4 GALVANIZING REPAIR PAINT
- A. High zinc dust content paint, Military Specification MIL-P-21035.
- 2.5 SHOP PRIMED SURFACES AND ASSEMBLIES
- A. Steel Surfaces
 1. Shop prime steel with primer for paint system as specified in Section 09900, painting schedule.
 2. If metal surfaces are shop primed with a coating other than the one specified in Section 09900, the Contractor shall submit in writing to the Engineer a statement that the primer is compatible with the required top coatings specified in Section 09900. Should the entire coating system fail down to bare metal as a result of the shop primer, the Contractor shall be responsible for removal of existing coatings, and re-priming and re-painting at no additional cost to the Owner.
- 2.6 SURFACE TREATMENT - FIELD APPLIED
- A. Galvanized surfaces: Items that must be drilled or cut in the field as approved by Engineer shall be coated with galvanizing repair paint before installation.
 - B. Painted surfaces: Touch-up damaged shop primed surfaces. Provide and apply field priming and finish painting as specified in Section 09900, painting schedule.
 - C. Field preparation and painting provided under Section 09900.

SECTION 05 50 00 – METAL FABRICATIONS

2.7 PIPE HANGER RODS

- A. Rods shall be cut and threaded to fit and galvanized after fabrication. The use of "all thread-rod" will not be accepted unless it is stainless steel in accordance with ASTM A 193 and used throughout the whole project.

2.8 CORROSION PROTECTION

- A. Ferrous metals that are not entirely embedded in concrete shall be hot-dip galvanized after fabrication. Other miscellaneous steel Items not specifically described elsewhere shall be hot-dip galvanized.

2.9 FABRICATION, GENERAL

- A. Verify dimensions on site prior to shop fabrication.
- B. Fabricate Items with joints neatly fitted and properly secured.
- C. Fit and shop assemble in largest practical sections, for delivery to site.
- D. Exposed mechanical fastenings: Flush countersunk screws or bolts unobtrusively located consistent with design of structure, except where specifically noted otherwise.
- E. Make exposed joints flush butt type hair line joints where mechanically fastened.
- F. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication.
- G. Clean surfaces of rust, scale, grease and foreign matter prior to prime painting, galvanizing, anodizing or buffing.
- H. Galvanize or prime paint steel Items as scheduled. Do not shop prime surfaces to be embedded in concrete. Primer is part of paint system specified in Section 09900. Conform with ASTM A 123 and A 153 as applicable. Provide minimum 2.00 ounce/square foot galvanized coating except as otherwise specified therein.
- I. Shop primers that do not contain rust-inhibitive agents are not acceptable.

SECTION 05 50 00 – METAL FABRICATIONS

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer must examine the areas and conditions under which miscellaneous metal items are to be installed and notify the Contractor in writing of conditions detrimental to the timely and proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner satisfactory to the installer.

3.2 PREPARATION

- A. Furnish setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors which are to be embedded in concrete or masonry. Coordinate delivery of such items to project site.

3.3 ERECTION

- A. Obtain Engineer's written permission prior to site cutting, welding, or making adjustments which are not part of scheduled work.
- B. Install items square and level, accurately fitted and free from distortion or defects.
- C. Make provision for erection stresses by temporary bracing. Keep work in alignment.
- D. Replace items damaged in course of installation.
- E. Grouting (see Section 03300):
 - 1. Grout anchor bolts and other items subject to pullout with epoxy grout.
 - 2. Use non-shrink grout for other grouting.
- F. After installation, touch up scratched and damaged prime painted and galvanized surfaces.
 - 1. Use same primer as used for shop priming of painted surfaces.
 - 2. Use galvanizing repair paint for galvanized surfaces.

3.4 PROTECTION OF ALUMINUM

- A. Aluminum in contact with masonry materials:
 - 1. Paint aluminum surfaces in contact with lime mortar, concrete or other masonry material with a heavy coat of bituminous paint.

SECTION 05 50 00 – METAL FABRICATIONS

B. Aluminum in contact with dissimilar metals:

1. Where aluminum surfaces are in contact with metals other than stainless steel, zinc, or small areas of white bronze, keep aluminum surfaces from direct contact with incompatible metals by any of the following methods:
 - a. Paint the dissimilar metal with bituminous paint
 - b. Apply a good quality caulking material between the aluminum and the dissimilar metal, only where accepted by the Engineer.
 - c. Use a non-absorptive tape or gasket only where accepted by the Engineer.
2. Dissimilar metals shall be coated when used in locations where drainage from them passes over aluminum.
3. Aluminum modifications/fabrication shall not be performed on-site unless Contractor obtains prior approval from Engineer.

3.5 PROTECTION OF STAINLESS STEEL

- A. Stainless steel modifications/fabrication shall not be performed on-site unless Contractor obtains prior approval from Engineer.

3.6 STAIR NOSING INSTALLATION

- A. Install stair nosing with 1/8-inch wide gap located between concrete tread material and nosing end, to provide for thermal expansion, fill gap with sealant.

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

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: ICC-ES evaluation reports for wood-preservative treated wood, engineered wood products and metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Provide dressed lumber, S4S, marked with grade stamp of inspection agency.
- B. Engineered Wood Products: Not Permitted.

2.2 TREATED MATERIALS

- A. Preservative-Treated Materials: AWPAC2, except that lumber not in ground contact and not exposed to the weather may be treated according to AWPAC31 with inorganic boron.
 - 1. Use treatment containing no arsenic or chromium.
 - 2. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 - 3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- B. Provide Hem-Fir #2, preservative-treated materials for the following:
 - 1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Concealed members in contact with masonry or concrete.
 - 3. Wood framing members that are less than 18 inches above the ground.
 - 4. Wood floor plates that are installed over concrete slabs-on-grade.
 - 5. Where indicated on the drawings.

SECTION 06 10 00 – ROUGH CARPENTRY

Dimension Lumber:

1. Maximum Moisture Content: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness.
 2. Non-Load-Bearing Interior Partitions: Douglas Fir No. 2 or better.
 3. Structural Bearing Walls or Joints: See Structural Notes
 4. Other: Douglas Fir No. 2 or better.
 5. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, which would impair finish appearance, included decay, honeycomb, know-holes, shake, splits, torn grain, and wane.
 - a. Species: As specified for framing.
 - b. Grade: Select Structural.
- C. Exposed Boards: Cedar, Select Knotty.
- D. Miscellaneous Lumber: Construction, or No. 2 grade with 15 percent maximum moisture content of any species. Provide for mailers, blocking, and similar members.
- E. Interior Trim: Primed/PG "Mansonite"

2.3 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Packing Panels: Plywood, Exterior, AC not less than 3/4-inch nominal thickness.

2.4 MISCELLANEOUS PRODUCTS

- A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M
1. Power-Driven Fasteners: CABO NER-272.
 2. Bolts: Steel Bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts, where indicated, flat washers.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction

End of Section

SECTION 06 16 00 – SHEATHING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: ICC-ES evaluation reports for preservative-treated plywood.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: DOC PS 1.
- B. Oriented Strand Board: DOC PS 2.

2.2 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural 1, sheathing. See Structural Notes.

2.3 MISCELLANEOUS PRODUCTS

- A. Fasteners: Size and type indicated.
 - 1. For roof sheathing, provide fasteners with not-dip zinc coating complying with ASTM A 153/A 153M.
 - 2. Power-Driven Fasteners: CABO NER-272.
- B. Adhesives for Field Gluing Panels to Framing: APA AFG-01.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Securely attach to substrates, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners. Spacing and size as noted.
- B. Nail to wood framing per Structural Notes

*** End of Section ***

SECTION 06 17 00 – SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, structural calculations data signed and sealed by a registered Professional Engineer responsible for their preparation, and ICC-ES evaluation reports for metal plate connectors and metal truss accessories.
 - 1. The drawings are contract documents, and sizes shown for walls and wood plates govern. Framing sizes are shown on the drawings, and drawings or calculations with “warnings” that plate sizes are insufficient for truss bearing shall be rejected. New drawings and calculations shall be provided at no cost to the owner.
 - 2. Shop drawings shall indicate required truss web bracing points and include typical bracing details clearly applicable to the project building. These shall be related to the project building by scale drawings and sketches that reflect the actual size and orientation of the bracing. Bracing details included by reference to industry standards are not acceptable. Shop drawings which do not show any and all needed bracing details shall be rejected, and new drawings shall be provided at no cost to the owner.
- B. Fabricator Qualifications: Shop that participated in a recognized quality-assurance program that complies with quality-control-procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities.
- C. Comply with the 2012 IBC with Washington State Building Code Amendments. The IBC governs over recommendations of the following publications:
 - 1. TPI 1, “National Design Standard for Metal Plate Connected Wood Truss Construction.”
 - 2. TPI DSB, “Recommended Design Specification for temporary Bracing of Metal Plate Connected Wood Trusses.”
 - 3. TPI BCSI, “Guide to Good Practice for Handling, Installing, Restraining & Bracing Metal Plate Connected Wood Trusses.”
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA’s “National Design Specifications for Wood Construction” and “Supplement.”

SECTION 06 17 00 – SHOP-FABRICATED WOOD TRUSSES

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads indicated without exceeding building code and TPI deflection limits.

2.2 MATERIALS

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review, any species, graded visually or mechanically.
 - 1. Provide dry lumber with 15 percent maximum moisture content at time of dressing.
- B. Connector Plates: TPI 1, fabricated from hot-dip galvanized-steel sheet complying with ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A, or high-strength low-alloy steel Type B; G60 coating designation; and not less than 0.036 inch thick.
- C. Fasteners: Where trusses are exposed to weather or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- E. Metal Framing Anchors: Provide framing anchors made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

2.3 FABRICATION

- A. Assemble trusses using jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted. Fabricated wood trusses within manufacturing tolerances in TPI 1.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install and brace trusses according to TPI recommendations and as indicated. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- B. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor.

SECTION 06 17 00 – SHOP-FABRICATED WOOD TRUSSES

- C. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Bracing lumber shall comply with Division 06 Section “Rough Carpentry.”
 - 2. Install and fasten strong-back bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- D. Install wood trusses within installation tolerances in TPI 1.
- E. Do not cut or remove truss members.
- F. Remove wood trusses that are damaged or do not meet requirements and replace with trusses that do meet requirements.

*** End of Section ***

SECTION 07 15 00 – BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

- A. Cold-Applied, Cut-Back (Solvent-Based) Asphalt Dampproofing:
 - 1. Brush and Spray Coats: ASTM D 4479, Type 1, fibered or nonfibered.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
- B. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
- C. Apply dampproofing to footings and foundation walls where opposite side of wall faces building interior.
 - 1. Apply from finished-grade line to top of footing; extend over top of footing, and down a minimum of 6 inches over outside face of footing.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforces," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- D. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs.
- E. Apply dampproofing to provide continuous plane of protection on interior face of above-grade, exterior concrete and masonry walls unless walls area indicated to receive direct application of paint.

SECTION 07 15 00 – BITUMINOUS DAMPPROOFING

F. Cold-Applied, Cut-Back Asphalt Dampproofing:

1. On concrete foundation walls apply two brush or spray coats, or one trowel coat.
2. On unparged masonry foundation walls, apply primer and two brush or spray coats, or primer and one trowel coat.
3. On Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat.

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

SECTION 07 19 10 – WATER REPELLANT

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 WATER REPELLANT

- A. Manufacturer: PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046.
Phone: (800) 225-4255; Fax: (785) 8309797. Email:
CustomerCare@prosoco.com

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Before applying, read “Preparation, Cleaning, Timing” and “Safety Information” sections in the Manufacturer’s Produce Data Sheet for Weather Seal Siloxane PD. Refer to the Product Date Sheet for additional information about application of Weather Seal Siloxane PD. Do no dilute or alter.
1. **Vertical Application:** For best results, apply protective treatment “wet-on-wet” to a visibly dry and absorbent surface.
 2. **Spray:** Saturate from the bottom up, creating a 4” to 8” (15 to 20 cm) rundown below the spray contact point. Let the first application penetrate for 5-10 minutes. Re-saturate. Less will be needed for the second application.
 3. **Brush or roller:** Saturate uniformly. Let protective treatment penetrate for 5 to 10 minutes. Brush out heavy runs and drips that don’t penetrate.
- B. Dense Surface Application Instructions
1. Apply in a single, saturating application with one run down. Back roll all runs and drips to ensure uniform appearance. DO NOT OVER APPLY. One application is normally enough. Always test.

3.2 HORIZONTAL APPLICATION INSTRUCTIONS

- A. Saturate in a single application. Use enough to keep the surface wet for 2 to 3 minutes before penetration.

SECTION 07 19 10 – WATER REPELLANT

- C. Broom out puddles until they soak in. Treated surfaces dry to touch in 1 hour. Protect surfaces from rainfall for 6 hours following treatment. Many surfaces need several days to develop full water repellency.
 - 1. Note: Protect from rain for 6 hours and from pedestrian and vehicular traffic until visibly dry.

*** End of Section ***

SECTION 07 19 50 – WEATHER BARRIERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: ICC-ES evaluation reports for water-resistive barrier.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIERS

- A. Building Wrap: ASTM E 1677. Type 1 air barrier; with water-vapor permeance not less than 5 perms per ASTM E 98. Desiccant Method (Procedure A); flame-spread and smoke-developed indexes not greater than 25 and 451, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

- 1. Products:

- a. Tyvek Commercial Wrap

2.2 ACCESSORIES

- A. Flexible Flashing: Adhesive butyl rubber compound, bounded to plastic file or spunbonded polyolefin, with an overall thickness of 0.030 inch.
- B. Building Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Building Wrap Installation:

- 1. Apply building wrap immediately after sheathing is installed.
 - 2. Seal seams, edges, fasteners, and penetrations with tape.
 - 3. Extend into jambs of openings and seal corners with tape.

SECTION 07 19 50 – WEATHER BARRIERS

B. Flexible Flashing Installation:

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 3 inches, except that at flashings flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller.

*** END OF SECTION ***

SECTION 07 20 00 – THERMAL INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. See Drawings for R-Value Requirements

PART 2 - PRODUCTS

2.1 INSULATION PRODUCTS

- A. Surface-Burning Characteristics: ASTM E 84, and as follows:
 - 1. Flame-Spread Index: 25 or less where exposed; otherwise, as indicated in Part 2 “Insulation Products: Article.
 - 2. Smoked-Developed Index: 450 or less.
- B. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type 1, pneumatic or Type 2, poured application, with flame-spread index of 25 or less.
- C. Blanket Insulation: Glass fiber thermal batt insulation for concealed applications.
 - 1. Unfaced, friction fit glass fiber thermal insulation complying with ASTM C 665, Type 1 (blankets without membrane facing) and ASTM E 136 for combustion characteristics.
 - 2. Kraft-faced glass fiber insulation complying with ASTM C 665, Type II, Class
 - a. Kraft facings on insulation will burn and must not be left exposed. The facing must be installed in substantial control with an approved interior partition construction material. K Protect facing from any open flame or heat source.
- D. Rigid Insulation: Under-slab/Foundation Insulation (Extruded Polystyrene Foam)
 - 1. Dow, Styrofoam CAVITYMATE or approved equal
 - 2. Thermal Resistance per inch (ASTM C518): R5.0
 - 3. Compressive Strength (ASTM D 1621): 15
 - 4. Water Absorption (ASTM C272): 0.3
 - 5. Water Vapor Permeance (ASTM E96): 1.5
 - 6. Maximum Use Temperature (F): 165
 - 7. Flexural Strength (ASTM C203) (psi): 40
 - 8. Thickness: Perimeter of Foundation: 2 inches unless indicated otherwise

SECTION 07 20 00 – THERMAL INSULATION

- E. Foam Sill Sealant: Ribbed polyethylene foam (total thickness 3/16"). 3/16" by 50 foot long rolls, 7 1/2" wide.

2.2 ACCESSORIES

- A. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed to fit between roof framing members and to provide cross-ventilation between attic space and vented eaves per IBC.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install insulation in areas and in thicknesses indicated or required to produce R- Values indicated. Cut and fit tightly around obstructions and fill voids with insulation.
- B. Except for loose-fill insulation and insulation that is friction fitted in stud cavities, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- C. Place loose-fill insulation to comply with ASTM C 1015.
 - 1. Comply with the CIMA's Special Report #3, "Standard Practice for Installing Cellulose Insulation."
- D. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage. Locate seams at framing members, overlap, and seal with tape.
- E. Secure foam Sill Seal level, straight and true. Install maximum lengths possible. Trim edges, place neatly over hold down bolts.

*** End of Section ***

SECTION 07 40 00 – METAL ROOF PANELS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Summary: Factory-formed metal roof panels and trim.
- B. Submittals: Product Data and Color Samples. Color to be selected by Kitsap P.U.D #1
- C. Warranties: Provide manufacturer's standard written warranty, pro-rated, signed by manufacturer agreeing to promptly repair or replace metal roof panels that final to remain weather-tight within 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 METAL ROOF PANELS

- A. Products
 - 1. AEP Span “Design Span hp” or approved equal roofing, 16” wide panels with minimum 1-3/4” easy lock ribs and surface striations to prevent oil canning. Comply with ASTM E1592, ASTM E1646, ASTM E1680, and UL 580 test, class 90
 - 2. Coated Steel Roof Panels – fabricated from aluminum-zinc alloy-coated.
 - 3. Nominal Metal Thickness: 24 gauge steel per ASTM A792, AZ50.
 - a. Finish: Manufacturer's standard or approved equal finish with Zinalume/Galvalume sub-coating; 70 percent Kynar 500 or Hylar 5000 exterior finish; primer with polyester at back/interior.

2.2 ACCESSORIES

- A. Provide components required for a complete roof panel assembly including trim, fasciae, clips seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing, Trim, Ridge Vent: Formed from 0.025-inch minimal thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet. Provide flashing and trim as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system and color as adjacent metal roof panels.

SECTION 07 40 00 – METAL ROOF PANELS

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Apply self-adhering sheet underlayment full coverage.
- B. Apply self-adhering sheet underlayment at valleys extending 18 inches (450 mm) on each side.
- C. Apply slip sheet over underlayment before installing metal roof panels.
- D. Install flashings to cover underlayment to comply with requirements specified in Division 07 Section “Sheet Metal Flashing and Trim.”
- E. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.
 - 1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.
 - 2. Provide metal closures at rake edges rake walls and each side of ridge and hop caps.
 - 3. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
 - 4. Install ridge caps as metal roof panel work proceeds.
- F. Install gaskets, joint fillers, and sealants where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants recommended by metal roof panel manufacturer.
- G. Separate dissimilar metals with a bituminous coating or self-adhering sheet underlayment.

*** End of Section ***

SECTION 07 46 00 – SIDING AND SOFFITS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Samples, and ICC-ES evaluation reports. Color to be selected by Kitsap P.U.D.
- B. Warranties: Provide written pro-rated warranty, signed by manufacturers agreeing to promptly repair or replace siding panels that fail to remain weather-tight within 15 years of date of Substantial Completion.

PART 2 – PRODUCTS

2.1 SIDING

- A. Cement fiber siding shall be James Hardie Company color-plus with baked on bond color.

2.2 SOFFIT

- A. AEP Span “Prestige” Series or approved equal nom. 1- 1/2” x 12” full profile panels, 24 gauge steel (ASTM A792) with 0.127” diameter vent holes (23.4% of area).
 - 1. Finish: 2 coats PVDF 70 percent Kynar 500 or Hylar 5000 exterior finish, or approved equal.

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide all items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories made from same material to match (color) as adjacent siding unless otherwise indicated.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install metal siding and soffit and related accessories according to manufacturer’s requirements.

*** End of Section ***

SECTION 07 60 00– SHEET METAL FLASHING & TRIM

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings and Samples.
- B. Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- C. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak-proof, secure, and noncorrosive installation.

PART 2 – PRODUCTS

2.1 SHEET METAL

- A. Aluminum Soffit Panels, Perforated. Per section 07460.
- B. Aluminum Sheet: ASTM B 209 alloy as standard with manufacturer for finish required, not less than 0.032 inch thick; and finished as follows:
 - 1. Finish: Manufacturer's standard two-coat fluoropolymer system with color coat containing not less than 70 percent PVDF resin by weight.
 - 2. Concealed Finish: Manufacturer's standard white or light-colored acrylic or polyester backer finish.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, with No. 2D finish; not less than 0.016 inch thick.
- D. Zinc-Tin Alloy-Coated Stainless Steel: ASTM A 240/A 240M, Type 304, fully annealed stainless-steel sheet, not less than 0.015 inch thick, with 0.787-mil thickness zinc-tin alloy coating applied to each side.
- E. Metallic-Coated Steel Sheet: Galvanized structural-steel sheet, ASTM A 653/A 653M, G90, or aluminum-zinc alloy-coated structural-steel sheet, ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 0.022-inch.
 - 1. Finish: Manufacturer's standard two-coat fluoropolymer system with color coat containing not less than 70 percent PVDF resin by weight.
 - 2. Concealed Finish: Manufacturer's standard white or light-colored acrylic to polyester backer finish.

SECTION 07 60 00– SHEET METAL FLASHING & TRIM

F. Gutters and Downspouts:

1. Provide continuous, roll-formed, factory finished aluminum gutters and round downspouts as shown. Provide all accessories, hangers, brackets, fasteners and sealants for a complete watertight installation.
2. Support gutters minimum 3 feet on center. Support downspouts at top bottom and at five feet on center. Connect to storm drainage system with caps formed to cut to match downspouts.

G. Downspout Brackets;

1. Provide pre-manufactured aluminum double half-round style bracket with attached stand-off rod. Install as shown on drawings with epoxy grout.

2.2 ACCESSORIES

- A. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts.
- B. Self-Adhering Sheet Underlayment: Butyl or SBS-modified asphalt: slip-resisting-polyethylene surfaced; with release paper backing; cold applied.
- C. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.
- D. Fasteners: Wood screws, annular-threaded mails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners.
 1. Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating.
 2. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel
 4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 5. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
 6. Fasteners for Metallic-Coated Steel Sheet: Hot-dip galvanized steel or Series 300 stainless steel.
- E. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- F. Folder for Zinc-Tin Alloy-Coated Stainless Steel: ASTM B32, 100 percent tin.
- G. Butyl Sealant: ASTM C 1311, solvent-release butyl rubber sealant.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

SECTION 07 60 00– SHEET METAL FLASHING & TRIM

2.3 FABRICATION

- A. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for residential Metal Roofing."

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Comply with SMACNA's "Architectural Sheet Metal Manual." Allow for thermal expansion; set true to line and level. Install Work with laps, joints, and seams permanent watertight and weatherproof; conceal fasteners where possible.
- B. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- C. Fabricate nonmoving seams in sheet metal with flat-lock seams. For aluminum, form seams and seal with epoxy seam sealer.
- D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered, to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
 - 1. Do not solder metallic-coated steel and aluminum sheet.
 - 2. Do not pretin tin alloy-coated stainless steel.
 - 3. Do not use torches for soldering. Heat surfaces to receive solder and slow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- E. Aluminum Flashing and Trim: Coat back side of aluminum flashing and trim with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.
- F. Separate dissimilar metals with a bituminous coating or polymer-modified, bituminous sheet underlayment.

*** End of Section ***

SECTION 07 90 00 – JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.
- B. Environmental Limitations: Do not proceed with installation of sealants when ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.

PART 2 – PRODUCTS

2.1 JOINT SEALANTS

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.
- B. Sealant for Use in Building Expansion Joints:
 - 1. Single-component, neutral-curing silicone sealant, ASTM C 920, type S; Grade NS; Class 100/50; for Use NT.
- C. Sealant for General Exterior Use One of the Following:
 - 1. Single-Component, nonsag polysulfide sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use NT.
 - 2. Single-Component, neutral-curing silicone sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use NT.
 - 3. Single-Component, nonsag urethane sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use NT.
- D. Sealant for Exterior Traffic-Bearing Joints, Where Slope Precludes Use of Pourable Sealant:
 - 1. Single-component, nonsag urethane sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use T
- E. Sealant for Exterior traffic-Bearing Joints, Where Slope Allows Use of Pourable Sealant:
 - 1. Single-component, pourable urethane sealant, ASTM C 920, Type S; Grade P; Class 25; for Use T.
- F. Sealant for Use in Interior Joints in ceramic Tile and Other Hard Surfaces in Toilet Rooms and Around Plumbing Fixtures:
 - 1. Single-component, mildew-resistant silicone sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use NT; formulated with fungicide.

SECTION 07 90 00 – JOINT SEALANTS

- G. Sealant for Interior Use at Perimeters of Door and Window Frames:
 - 1. Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
- H. Acoustical Sealant:
 - 1. Nonsag, paintable, non-staining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission as demonstrated by testing according to ASTM E 90.

2.2 MISCELLANEOUS MATERIALS

- A. Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.
- D. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Comply with ASTM C 1193.
- B. Install sealant backings to support sealants during application and to produce cross-sectional shapes and depths of installed sealants that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

*** End of Section ***

SECTION 08 10 00 - METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Products Installed but not Furnished Under this Section: Finish Hardware specified in Section 08700.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. A 366 - "Specification for Steel, Carbon, Cold- Rolled Sheet, Commercial Quality."
 - 2. A 526 - "Specification for Steel Sheet, Zinc- Coated (Galvanized) by the Hot-Dip Process, Commercial Quality."
- B. Steel Door Institute (SDI).
 - 1. 100 - "Recommended Specifications, Standard Steel Doors and Frames."
 - 2. 105 - "Recommended Erection instructions for Steel Frames."
 - 3. 107 - "Hardware on Steel Doors (Reinforcement- Application)."

1.03 QUALITY ASSURANCE

- A. Qualifications: Comply with SDI Publication, 100.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Doors: Commercial quality cold-rolled sheet steel in conformance with ASTM A 366. Stretcher level steel for door faces. Hot-dip galvanize steel for exterior doors in conformance with ASTM A 526, G90 coating designation, factory baked on primer.
- B. Hardware: Comply with SDI 107. Furnished as specified in Section 08700.

SECTION 08 10 00 - METAL DOORS AND FRAMES

2.02 FABRICATION

- A. Exterior Insulated Hollow Metal (INS HM) Doors:
 - 1. Type: Standard-duty, full flush panel, in accordance with SDI 100 for Grade II, Model 1 doors, polyurethane or polyisocyanurate core.
 - 2. Steel Grades: 18 gauge face sheets minimum
- B. Frames: One-piece, welded, 16 gage minimum, galvanized, with integral stops, jambs, and trim in accordance with SDI 100 for Grade II, Model 2 doors.
- C. Tempered Glass Windows: Provide as specified on door schedule.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with SDI 105, manufacturer's recommendations, and requirements of labeling authority.
- B. Install hardware, adjust, and lubricate for proper operation.

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

SECTION 08 70 00 – FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

- A. Description: Work under this section includes the complete finish hardware requirements for the project. Quantities listed are for the contractor's convenience only and are not guaranteed. Items not specifically mentioned but necessary to complete the work shall be furnished, matching the items specified in quality and finish.
- B. The Contractor shall be responsible for proper operation and fitting of hardware in locations specified. Exposed surfaces of hardware shall be covered and well protected during installation so as to avoid damage to finishes.
- C. Work not Included: Hardware not included in this division but specified elsewhere:
 - 1. Metal Fabrications - Section 05500.
 - 2. Finish Carpentry - Section 06200.
 - 3. Metal Doors and Frames - Section 08100.
 - 4. Rolling Doors - Section 08330.

1.02 QUALITY CONTROL

- A. Supplier: Finish hardware shall be supplied by recognized builders' hardware supplier who has been furnishing hardware in the same area as the project for a period of not less than two years.
- B. Codes:
 - 1. All finish hardware shall comply with applicable local and state current building codes.
 - 2. Provide hardware which meets or exceeds handicapped accessibility per local and state building code requirements.

1.03 SUBMITTALS

- A. Manufacturer's Data: Submit copies of manufacturer's data for each item of finish hardware with each hardware schedule submitted per Section 01300 - Submittals.
- B. Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware. Based on finish hardware indicated,

SECTION 08 70 00 – FINISH HARDWARE

organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, function, size and finish of each hardware item.
 2. Name of manufacturer of each item.
 3. Fastenings and other pertinent information.
 4. Location of hardware set cross referenced to indications on drawings both on floor plans and in door and frame schedules.
 5. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
 6. Recommended mounting locations for hardware.
- C. Submittal Sequence: Submit copies of schedule at earliest possible date in accordance with requirements in Division -1, particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
- D. Keying Schedule: Submit separate detailed schedule indicating how the owner's final instructions on keying of locks has been fulfilled.
- E. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory or shop prepared for the installation of hardware. Upon request, check shop drawings of other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.04 PRODUCT HANDLING

- A. Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set number of approved hardware schedule. Two or more identical sets may be packed in the same container.
- C. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

SECTION 08 70 00 – FINISH HARDWARE

1.05 GUARANTEE

- A. Finish hardware shall be guaranteed against defects in workmanship and operation for a period of one year, backed by a factory guarantee of the hardware manufacturer, except that door closers shall be so guaranteed for five years. No liability shall be assumed by the hardware supplier where faulty operation is due to improper installation or failure to exercise normal maintenance.

PART 2 - MATERIALS

2.01 MANUFACTURERS: See PART FOUR HARDWARE SCHEDULE.

2.02 MATERIALS AND FABRICATION GENERAL:

- A. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- B. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable name plates), except in conjunction with required UL or FM labels and as otherwise acceptable to the Architect. Manufacturer's identification will be permitted on rim of lock cylinders and latch faceplates only.
- C. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- D. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self tapping sheet metal screws, except as specifically indicated.
- E. Furnish screws for installation, with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finishes of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

SECTION 08 70 00 – FINISH HARDWARE

- F. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or not on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provides leaves for each thru-bolt or use sex screw fasteners.
- G. Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

2.03 LOCKSETS AND LATCHSETS

- A. Key-in-knob type, steel cylindrical case with interior parts plated to resist corrosion, with access to cylinder without removal from the door, 2-3/4" backset. Design as specified.
 - 1. Strikes: Standard strikes sized to extend no more than 3/16" beyond door frame or adjacent trim.
 - 2. Keying: Keyed and registered at the factory, 6 pin cylinders, master keyed, keyed alike conforming to KPUD standard. All keys shall be tagged with room or door identification and delivered by the manufacturer direct to the Owner.

2.04 CLOSERS

- A. Full rack and pinion construction with tamperproof valves to control closing, latching, and backcheck. Furnish proper mounting hardware to suite installation conditions, including all required screws or bolts. Provide thru bolts at wood doors with carriage heads exposed. Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending on the size of the door, exposure to weather and anticipated frequency of use. Where parallel arms are indicated for closers, adjust closer unit one size larger than recommended for use with standard arms. Provide arms for closers which allow the closer to be mounted on the room side, unless otherwise noted. Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force. Fire protection has precedence over handicapped compatibility, check with local jurisdiction.

SECTION 08 70 00 – FINISH HARDWARE

2.05 WEATHER STRIPPING:

- A. General: Except as otherwise indicated, provide continuous weather stripping at each edge of every exterior door leaf. Provide type, sizes and profiles as indicated as drawn or scheduled. Provide non-corrosive fasteners as recommended by the manufacturer for applications indicated.
- B. Perimeter weather strip: Flexible, hollow neoprene bulb or loop insert, conforming to MIL R 6055, Class II, Grade 40.

2.06 KICK, MOP AND ARMOR PLATES

- A. Plastic, 1/8" thick, laminated double face balance construction, color as selected. Metal: Minimum 0.050 inch thick, finish as specified. Furnish and widths as required to provide 1/4" clearance at sides of doors and stops, heights as specified. Furnish oval head mounting screws and mounting adhesive as recommended by manufacturer.

2.07 STOPS AND HOLDERS

- A. Exterior Doors: All exterior doors are to be equipped with heavy duty stainless steel latching door stops, which include door stop, holder, hook, ring, and door plate. See exterior door stop detail, Sheet C4.0 (Ives Model FS446, Contact Sargent Manufacturing Company, Doug Holderman 425-392-2358)
- B. Interior Doors: Furnish as required to protect all walls, cabinets, or other hardware operation. Furnish wall stops wherever possible, unless otherwise scheduled. Also furnish plunger door holders for all interior doors. (Ives Model FS1153, Contact Sargent Manufacturing Company, Doug Holderman 425-392-2358).

DOOR SILENCERS

- A. Furnish three for each single door frame, and four for each double door frame.

2.09 FINISHES

- A. All items, unless otherwise specified, US26D Dull Chrome. Exposed closers, factory finished, US26D or spray painted aluminum to match adjacent hardware.

SECTION 08 70 00 – FINISH HARDWARE

2.10 THRESHHOLDS

- A. Furnish for each door opening.

2.11 TEMPERED GLASS WINDOWS

- A. Furnish 24" x 24" tempered glass windows with Type C and Type D doors.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Provide solid blocking for all wall stops. Check all conditions and use fastening devices as needed to securely anchor all hardware as per manufacturer's published templates. Self-tapping sheet metal screws are not acceptable. All closers and exit devices on wood doors shall be thru-bolted.

3.02 INSTALLATION

- A. Mounting heights: Mount units at heights recommended in "Recommended Locations for Builders' Hardware" by NBHA, except as otherwise indicated or as required by State Barrier Free regulations.
- B. Install each hardware item in compliance with the manufacturer's instructions. Wherever cutting and fitting are required to install hardware on surfaces which will be painted or finished at a later time, install each item completely and then remove and store in a secure place. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Adjust and check each operating item of hardware and each door to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units which are not factory prepared for fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in a full bed of butyl-rubber or polyisobutylene mastic sealant.

SECTION 08 70 00 – FINISH HARDWARE

3.03 HARDWARE LOCATIONS

- A. The following shall be used in absence of other specifications from door manufacturers:
- Center of knob at Rail & Stile: Center on Mid Rail
 - Center of knob to finished floor: 36"
 - Bottom butt: bottom of door to bottom of butt: 10"
 - Top butt - top of door to top of butt: 5"
 - Center butt: equals distance between top and bottom butts.

3.04 ADJUSTMENT

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Wherever hardware installation is made more than one month prior to acceptance or occupancy, make a final check and adjustment of all hardware items during the week prior to acceptance of occupancy. Clean and lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the installer, accompanied by the representative of the lock and latch manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.05 SPECIAL TOOLS

- A. Contractor shall provide 2 sets of any special tools required for installation and maintenance of hardware.

SECTION 08 70 00 – FINISH HARDWARE

PART 4 - HARDWARE SCHEDULE

4.01 MANUFACTURERS

- A. Each hardware symbol is followed by the model number of the first manufacturer listed for the item, unless otherwise identified. Such designation is intended to establish a standard of quality, function, and appearance for the various finish hardware items.

<u>Manufacturer Specified</u>	<u>Approved Substitutions</u>
Stanley	Hager, McKinney, Lawrence
Best	None
Ives	Quality, Rockwood
Tice	Quality, Rockwood
Pemko	National Guard, Reese

4.02 HARDWARE GROUPS

(Note: Confirm active door size before ordering doors/hardware)

Hardware Group #1 - (insulated hollow metal doors - exterior single door)

4 pr Hinges	Stanley FBB179 4-1/2x4-1/2 NRP
1 ea. Lockset	Latchbolt by key outside or by grip either side, unless outside grip is locked by toggle-action stop. Auxiliary latch deadlocks latch- bolt. Inside grip always free. Corbin Russwin ML2000 Series Grade Mortise Locksets with Lustra Lever Trim and Escutcheon Plate (satin chrome), include Russwin Mortise Cylinders. Keyway to match City Standard.
1 set Flushbolts	Ives 458-26D manual flush bolts
1 ea. Dust Proof Strike	Ives DP2 (US26D)
1 ea. Closers	Sargent 421 Series
1 ea. Kickplate (Protection Plate)	PLKP 10x2" LD CAS
1 ea. Door Bottom Sweeps	Pemko 315SN
1 ea. Threshold	National Guard 713
1 ea. Exterior Stops & Holders	Ives Model FS446

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

SECTION 09 25 00 - GYPSUM DRYWALL

PART 1 - GENERAL

1.01 SUMMARY

- A. Work includes furnishing and installing all gypsum drywall shown including taping and spackling.

1.02 QUALITY CONTROL

- A. Gypsum board application and finishing standard: Install and finish gypsum board to comply with ASTM C 840.
- B. Single source responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
- C. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- D. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.03 SUBMITTALS

- A. Samples: Submit samples of texture finish for approval before application.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

1.04 PROJECT CONDITIONS

- A. Environmental conditions, general: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
- B. Minimum room temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board maintain not less than 50 deg. F for 48 hours prior to application and continuously thereafter until drying is complete.
- C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

SECTION 09 25 00 - GYPSUM DRYWALL

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Gypsum wallboard: DensArmor Plus Interior Panels manufactured by Georgia Pacific (yellow board – mold and moisture resistant - type gypsum drywall). Sheet rock edges tapered. Thickness: 5/8" unless noted otherwise. Conform to ASTM C-36. Provide Type X for fire-rated assemblies.
- B. Screws: Conform to ASTM C-1002.
- C. Accessories: USG Dur-A-Bead corners, 200-A ("LC") and 200-B ("L") Grounds. Comply with ASTM C-1047.
- D. Tape and compound: U.S. Gypsum Perf-A-Tape. Comply with ASTM C-475 and ASTM C-840.
- E. Spackle texture: USG Imperial QT Spray.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board has been installed.
- B. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.
- C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- D. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24 inches.
- E. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

SECTION 09 25 00 - GYPSUM DRYWALL

- F. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- G. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- H. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.
- I. Cover both faces of stud partition framing with gypsum board in concealed spaces (above ceilings, as shown, etc.). Fit gypsum board around ducts, pipes, and conduits.
- J. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.
- K. Single-layer application: Install gypsum wallboard as follows:
 - 1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
 - 2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which will minimize end joints.
 - 3. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
- L. Single-layer fastening methods: Apply gypsum boards to supports as follows:
 - 1. Fasten with self-drilling screws to steel framing at 12" o.c. maximum. Conform to UBC fastener spacing.
 - 2. Double-layer fastening methods: Apply base layer of gypsum board and face layer to base layer as follows: Fasten both base layers and face layers separately to supports with screws.
- M. Installation of drywall trim accessories:

SECTION 09 25 00 - GYPSUM DRYWALL

1. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
2. Install corner beads at external corners.
3. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound.
 - a. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - b. Install "L" bead where edge trim can only be installed after gypsum board is installed.

3.03 FINISHING

- A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.
- B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.
- C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
- D. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:
 - Embedding and first coat: Ready-mix drying-type all-purpose or taping compound.
 - Fill (second) coat: Ready-mix drying-type all-purpose or topping compound.
 - Finish (third) coat: Ready-mix drying-type all-purpose or topping compound.
- E. Partial finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

3.04 APPLICATION OF TEXTURE FINISH

SECTION 09 25 00 - GYPSUM DRYWALL

- A. Surface preparation and primer: Prepare and prime drywall and other surfaces in strict accordance with texture finish manufacturer's instructions. Apply primer to all surfaces to achieve texture finish. See Section 09900 Painting for primer paint coat.
- B. Finish application: Mix and apply finish to drywall and other surfaces indicated to receive finish in strict accordance with manufacturer's instructions to produce a uniform texture matching Architect's sample without starved spots or other evidence of thin application, and free of application patterns.
- C. Remove any texture droppings or overspray from door frames, windows and other adjoining construction.
- D. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion.

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

SECTION 09 26 00 – CEMENT FIBER SIDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Work includes furnishing and installing all cement fiber siding shown including weather barrier (including flashing and seam tape as necessary) and caulking all joints. Cement fiber siding to be used as the south interior wall in blower room of the Control Building (per finish schedule) and as external siding as shown on plans of Control Building.

1.02 QUALITY CONTROL

- A. Cement fiber siding, weather barrier, and caulk application and finishing standard: Install and finish cement fiber siding, weather barrier (including flashing and seam tape), and caulk to comply with manufacturers recommendations.
- B. Single source responsibility: Obtain each type of cement fiber siding and related weather barrier (including flashing and seam tape) from a single manufacturer.
- C. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- D. Handle cement fiber siding to prevent damage to edges, ends, and surfaces. Protect edges and corners from breakage. Neatly stack cement fiber siding flat to prevent sagging. Store materials inside under cover and store flat and keep dry and covered prior to installation. Protect against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes.
- E. Store weather barrier in a covered area and do not expose to direct sunlight or building site chemicals.

1.03 SUBMITTALS

- A. Samples: Submit samples of texture finish of cement fiber siding and samples of weather barrier (including flashing and seam tape) for approval before application.
- B. Product Data: Submit catalog cut sheets of cement fiber siding, weather barrier (including flashing and seam tape), and caulk.

1.04 PROJECT CONDITIONS

- A. Environmental conditions, general: Establish and maintain environmental conditions for application and finishing cement fiber siding, weather barrier and caulk to comply with each manufacturer's recommendations.

SECTION 09 26 00 – CEMENT FIBER SIDING

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement Fiber Siding for Interior Applications: James Hardie Commercial. HardiePanel siding. Dimensions: 4' x 8'. Thickness: 5/16". Weight: 2.3 lbs/sq.ft. Texture: smooth. Finish/Color: primed.
- B. Cement Fiber Siding for Exterior Applications: James Hardie Commercial. HardiePlank Lap Siding. Dimensions: 12" x 12' length. Thickness: 5/16". Texture: cedarmill. Finish/Color: primed.
- C. Weather Barrier: James Hardie Commercial. HardiWrap weather barrier. Sized to be installed with cement fiber siding as specified in A. Required flashing and seam tape shall also be manufactured by James Hardie Commercial, HardieWrap Flashing and HardieWrap Seam Tape, respectively.
- D. Fasteners:
 - 1. Cement Fiber Siding: Hot-dipped galvanized nails, sized per manufacturer's recommendations
 - 2. Weather Barrier: Construction grade galvanized staples, sized per manufacturer's recommendations.
- E. Caulking: Elastomeric Joint Sealant complying with ASTM C920 Grade NS, Class 25 or higher or a Latex Joint Sealant complying with ASTM C834.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine substrates to which cement fiber siding and weather barrier construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of cement fiber siding and weather barrier construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install weather barrier before window and door installation (as applicable). Install over dry materials. Do not install on saturated sheathing. Install all window, door, electrical or plumbing penetration flashing before installing weather barrier.
- B. Begin by affixing weather barrier extending at least 6 inches around a building corner. (In the case of an interior installation, affix weather barrier at inside corner to allow for a tight fit and installation.) Unroll horizontally (with print side facing out) around the building covering rough window and door openings. Fasten to studs or nailable sheathing material

SECTION 09 26 00 – CEMENT FIBER SIDING

with galvanized construction grade staples a maximum of 24” in the vertical and horizontal direction.

- C. Attach weather barrier so that it is taut and flat. The vertical overlap must have a minimum of 6 inches and the vertical seam must be taped with seam tape. Do not clog or interfere with the use of weep holes or similar drainage details.
- D. Assure that the bottom edge of the weather barrier extends over the sill plate and foundation interface by at least 1”.
- E. Overlap upper layers of weather barrier (in shingle lap fashion) by a minimum of 6 inches below the horizontal edge, and tape the horizontal seam line.
- F. At any intersection with flashing, affix wrap to the wall such that it overlaps flashing by at least 2 inches.
- G. Cement fiber siding is then installed over the weather barrier and flashing. Install using the Caulk Joint method per manufacturer.

If cutting of cement fiber siding is required, use an NIOSH-approved respirator and adhere to the following manufacturer guidelines:

1. Indoors:

- Cut only using score and snap, or shears (manual, electric or pneumatic)
- Position cutting station in well-ventilated area
- NEVER use a power saw indoors
- NEVER use a circular saw blade that does not carry the HardieBlade saw blade trademark
- NEVER dry sweep – Use wet suppression or HEPA Vacuum

2. Outdoors:

- Position cutting station so that wind will blow dust away from user and others in working area
- Use one of the following methods:
 - Best: score and snap, shears (manual, electric or pneumatic)
 - Better: Dust reducing circular saw equipped with a HardieBlade saw blade and HEPA vacuum extraction
 - Good: Dust reducing circular saw with a HardieBlade saw blade (only use for low to moderate cutting)

- H. General Requirements for cement fiber siding installation: Maintain a 1” – 2” clearance between cement fiber siding and roofs, decks, paths, steps and driveways. Maintain a 1/4” clearance between cement fiber siding and horizontal flashing. Do not install cement fiber siding such that they remain in contact with standing water. Install cement fiber siding on vertical wall applications only. DO NOT use stain on cement fiber siding.

SECTION 09 26 00 – CEMENT FIBER SIDING

- I. Fastener Requirements for cement fiber siding: Position fasteners 3/8" from panel edges and no closer than 2" away from corners. Do not nail into corners. Drive fasteners perpendicular to siding and framing. Fastener heads should fit snug against siding (no air space). Do not over-drive nail heads or drive nails at an angle. If nail is countersunk, caulk nail hole and add a nail. For wood framing, under driven nails should be hit flush to the plank with a hammer (For steel framing, remove and replace nail).

Cement fiber siding can be hand nailed or fastened with a pneumatic tool. Pneumatic fastening is highly recommended. Set air pressure so that the fastener is driven snug with the surface of the siding. A flush mount attachment on the pneumatic tool is recommended. This will help control the depth the nail is driven. If setting the nail depth proves difficult, choose a setting that under drives the nail. (Drive under driven nails snug with a smooth faced hammer - does not apply for installation to steel framing.)

- J. Other Requirements: Framing must be provided at horizontal and vertical edges for nailing. Cement fiber siding must be joined on stud. Double stud may be required to maintain minimum edge nailing distances.

3.03 FINISHING

- A. Caulking Requirements: Caulking/Sealant must be applied in accordance with the caulking/sealant manufacturer's written instructions or ASTM C1193.

3.04 APPLICATION OF PAINT FINISH

- A. DO NOT use stain on cement fiber siding. Cement fiber siding must be painted within 180 days for primed product. Paint shall be 100% acrylic topcoat per Section 09900 Service Condition I (Product: Sherwin-Williams SuperPaint Machine Finish for Fiber Cement A89-600 Series). Do not paint when wet. For application rates refer to paint manufacturers specifications. Back-rolling is recommended if the siding is sprayed.

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

SECTION 09 90 00 - PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Description of System: The work covered by this section consists of furnishing all labor, equipment and materials necessary for the preparation and application of the paint coatings as specified herein.

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Comply with the requirements of agencies having jurisdiction over this section of work, including, but not limited to:
 - 1. WISHA, Washington Industrial Safety and Health Act.
- B. Reference Standards: All surface preparation, coating and painting shall conform to the applicable requirements of the:
 - 1. National Association of Corrosion Engineers
 - 2. Steel and Structures Painting Manual, Volume 2, Systems and Specifications (latest revision) published by the Steel Structures Painting Council (SSPC).
 - 3. American Water Works Association (AWWA) Standard D102 "Painting Steel Water Storage Tanks."
- C. Manufacturer: Manufacturer shall be of established good reputation and shall have regularly engaged in the manufacture of such coatings for a minimum of 5 years. This experience shall include a minimum of 20 similar applications in which such coatings have proven satisfactory service for a minimum of 3 years.
- D. Contractor: Contractor shall have 5 years of practical experience and successful history in the application of paint coatings to surfaces of municipal or industrial type equipment.
- E. Paint Film Thickness: All painted surfaces will be inspected by the Contractor with approved wet-film thickness gages. Inspection will include the thickness measurement of each prime and finish coat.
- F. Manufacturer's Representative: The manufacturer shall provide a qualified representative to visit the site from time to time during the paint operations as requested by the Engineer. The manufacturer's representative shall assist the Engineer in monitoring surface preparation and paint application.

1.03 SUBMITTALS

SECTION 09 90 00 - PAINTING

- A. Submittals detailing product data and application procedures shall be submitted in accordance with Section 01300 for each paint service condition.
- B. Color charts for each of the finish coats listed in Part II of this section shall be submitted at least thirty (30) days prior to the starting of painting.
- C. A Schedule of the Painting Work shall be submitted to the Engineer at least fourteen (14) days prior to commencing of any work under this section. A revised schedule shall be submitted as requested by the Engineer to reflect changes or delays in the work.

1.04 JOB CONDITIONS

- A. Environmental:
 - 1. Protective coatings shall not be applied in areas where dust is being generated or in any other areas where disturbances will affect the quality of the work.
 - 2. The Contractor shall comply with the manufacturer's recommendations as to environmental conditions (i.e. temperature, moisture, exposure to sunlight etc.) under which coatings and coating systems must be applied and cured.
- B. Protection: The Contractor shall be responsible for protecting coatings or coating systems from any disturbances during or after application which will affect the quality of the work.

1.05 DELIVERY AND STORAGE

- A. Delivery: All products shall be delivered in sealed containers with labels legible and intact. Labels shall include the following information: Manufacturer's name and stock number, type of paint or protective coating, color, instructions for reducing, label analysis, and federal specification number.
- B. Storage: Products shall be stored in a single location and in a manner complying with all applicable safety, health and fire regulations.

SECTION 09 90 00 - PAINTING

PART 2 - PRODUCTS

2.01 GENERAL

- A. Surfaces to receive insulation or other protective materials shall be coated or painted in conformance with the applicable Service Conditions as specified herein.

The intent has not been to identify each and every item to be coated, but only to list the major items. In no case shall any wood, ferrous metal or other surface requiring protection, be left uncoated or unpainted.
- B. The products specified are those which have been evaluated for the specific service and are given to establish a quality standard for that service. Products of other manufacturers comparable in quality and type to those specified will be acceptable if said paints are offered by the Contractor with satisfactory data on past performance in similar applications. Requests for substitutions shall be in accordance with Section 01600.
- C. The Contractor shall use products of the same manufacturer for all prime and finish coats listed in each separate Service Condition.
- D. Colors to be used shall be as designated by the Owner based upon the color charts provided by the Contractor.
- E. For the paint thickness listed under each Service Condition:
 - 1. WT = wet-film thickness in mils
 - 2. DF = dry-film thickness in mils
 - 3. The number following equals the minimum film thickness required, per coat.
 - 4. Putty: Conform to FS TT-P-791A(3), colored to match paint and stain finishes, as applicable.
- G. Cementitious Filler: Nonshrink formulation, white Portland cement with fine silicate aggregate, zinc-oxide pigment, and reinforcing chemical binder as approved.
- H. Spackling Compound: Standard gypsum board compound.
- I. Unspecified materials such as turpentine, linseed oil, or mineral spirits shall be products of reputable manufacturers and as recommended by paint manufacturers.
- J. Materials for Undercoats and Finish Coats: Ready mixed, and shall not be changed, except thinning of undercoats (when required), reinforcing, or coloring,

SECTION 09 90 00 - PAINTING

all of which shall be performed in accordance with manufacturers' recommendations.

SERVICE CONDITION A

- A. Generic Type: Epoxy
- B. Applications:
 - 1. All exposed metal piping (including exposed ductile iron piping), joints, fittings, valves, supports, bollards, yard hydrant accessories, runway beams, runway supports, fasteners, and misc. ferrous metal items for this project shall be painted. Copper, galvanized, aluminum, and stainless steel metal surfaces shall not be painted unless specifically specified. Exposed piping shall be defined as all piping that is not backfilled. Exposed piping in vaults is considered to be exposed and shall be painted. All bollards are to be completely protected with shop coatings (primer and finish).
- C. Primer:
 - 1. One coat Tnemec Series 161- "High Solids Epoxy".
DF = 4.0 to 6.0
- D. Finish:
 - 1. One coat Tnemec Series 161- "High Solids Epoxy".
DF = 4.0 to 6.0

SERVICE CONDITION B

- A. Generic Type: Semi-gloss alkyd enamel.
- B. Application: Interior wood surfaces.
- C. Primer: One coat Sherwin-Williams PrepRite Wall and Wood Interior Oil Primer/Undercoater, alkyd, DF = 1.9.
- D. Finish: Two coats Sherwin-Williams ProMar 200 Interior Alkyd Semi-Gloss, DF = 3.4.

SERVICE CONDITION C

- A. Generic Type: Metal, gloss alkyd enamel.
- B. Application: Metal doors and frames.
- C. Primer: Factory baked on enamel.
- D. Finish: Two coats Sherwin-Williams Industrial Enamel, DF = 4.0.

SECTION 09 90 00 - PAINTING

SERVICE CONDITION D

- A. Generic Type: PVC, Vinyl Copolymer
- B. Application: PVC piping
- C. Finish: Two coats of Tnemec Series 73 Endurashield, DF = 3.0

SERVICE CONDITION E

- A. Generic Type: Solid Color Acrylic Stain
- B. Application: All exterior wood surfaces
- C. Finish: Two coats Cabot O.V.T. Solid Color Acrylic Stain

SERVICE CONDITION F

- A. Generic Type: Egg-shell alkyd enamel.
- B. Application: Gypsum board
- C. Primer: One coat Sherwin-Williams wall primer DF=2.0
- D. Finish: Two coats Sherwin-Williams Pro-Mar alkyd egg-shell, DF=4.0

SERVICE CONDITION G

- A. Product: Waterborne Acrylic Dry Fall (B42W1)
- B. Application: Acoustical wall and ceiling panels
- C. Primer: One coat Sherwin-Williams Waterborne Acrylic Dry Fall, DF=2.0
- D. Finish: Two coats Sherwin-Williams Waterborne Acrylic Dry Fall, DF=4.0

SERVICE CONDITION H

- A. Generic Type: Concrete sealer, non-skid/slip-resistant
- B. Application: Interior concrete slab finish
- C. An SSPC SP 1 (Solvent Cleaning) to remove grease oil or any other contaminants, if present.
- D. Entire area to be coated is to be mechanically etched (diamond grinders, shot blaster, etc.) or chemically etched (Acid etch concrete with a 25% muriatic acid & 75% water solution. Allow to etch for 10 to 15 minutes, and rinse with clean water to neutralize. Allow floor to dry) to supply a minimum 1 mil profile.
- E. Full Prime coat of Wasser MC-CR 100 (White or Buff) thinned 20% @ 3 to 4 mils DFT

SECTION 09 90 00 - PAINTING

- F. Full Top coat of Wasser MC–Luster 100 @ 2 to 4 mils DFT.

When applying a nonskid floor, broadcast non-skid into the prime coat (MC-CR 100) allow to dry sweep of excess sand then apply MC- luster 100.

This service condition is required for the Wellhouse Building floor.

SERVICE CONDITION I

- A. Generic Type: 100% acrylic topcoat
- B. Application: Interior cement fiber siding
- C. Primer: Not applicable (product comes primed from manufacturer)
- D. Finish: Two coats Sherwin-Williams SuperPaint Machine Finish for Fiber Cement, DF=3.6

SERVICE CONDITION J

- 1) Generic Type: 100% acrylic topcoat
 - A. Application: Interior & Exterior Cement Masonry Unit finish
 - B. An SSPC SP 1 (Solvent Cleaning) to remove grease oil or any other contaminants, if present.
 - C. Entire area to be coated shall be chemically etched (Acid etch concrete with a 25% muriatic acid & 75% water solution. Allow to etch for 10 to 15 minutes, and rinse with clean water to neutralize. Allow surfaces to dry) to supply a minimum 1 mil profile.
 - D. Full Prime coat of Wasser MC-CR 100 (White or Buff) thinned 20% @ 3 to 4 mils DFT
 - E. One to two coats of Wasser MC–Luster 100 (as needed to supply a uniform color and finish) @ 2 to 4 mils DFT

This service condition is required for the Wellhouse Building CMU (interior and exterior).

PART 3 - EXECUTION

3.01 GENERAL

- A. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. The intent of the coating systems is to obtain smooth, clean, dry and well protected surfaces.

SECTION 09 90 00 - PAINTING

- B. All coating and painting shall conform to applicable standards of the National Association of Corrosion Engineers and the Steel Structures Painting Council Manual. Material applied prior to approval of surface by the Engineer shall be removed and reapplied at the expense of the Contractor to the satisfactions of the Engineer.
- C. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in a grease solvent and wiped with clean dry rags. Slag and weld metal accumulation and spatters shall be removed by chipping and grinding. All sharp edges shall be peened, ground or otherwise blunted as required by the Engineer.
- D. Painting systems include surface preparations, prime coatings and finish coatings. Unless otherwise specified, prime coat-coatings shall be field applied. Where prime coatings are shop applied, they shall be thoroughly cleaned and touched up in the field as specified. Any off site work which does not conform to this specification is subject to rejection by the Engineer.
- E. The Contractor's coating and painting equipment shall be designed for the application of the materials specified and shall be maintained in first class working order. The Contractor's equipment shall be subject to approval of the Engineer.

SECTION 09 90 00 - PAINTING

- F. Application of the first coat shall follow immediately after surface preparation and cleaning and within an eight-hour working day. Any cleaned areas not receiving first coat within an eight-hour period shall be re-cleaned prior to application of first coat.
- G. Prior to assemble, all surfaces that are inaccessible after assembly shall be prepared as specified herein and shall receive the paint or coating system specified.
- H. Drop cloths shall be used to protect floor and adjoining work from splatter. Any paint surface damaged shall be repaired to the satisfaction of the Engineer before the work will be accepted. The lines formed by changes in color of coatings shall be neat and straight.

3.02 SURFACE PREPARATION

- A. General:
 - 1. All surfaces to be painted shall be prepared in a workmanlike manner with the objective of obtaining a clean and dry surface. Surfaces shall be cleaned of all oil, rust, grease, dust, scale, and other foreign substances that may inhibit bonding.
 - 2. Field blast cleaning for all surfaces shall be dryblasted unless otherwise directed. Maximum particle size of abrasives shall be that which will produce a profile in accordance with recommendations of the coating manufacturer.
- B. All interior and exterior welded and abraded steel shall be sandblast cleaned in conformance with SSPC Section SP10 (Near White Blast Cleaning).
- C. Shop-Primed Ferrous Metal: Contractor shall be responsible for compatibility of the applied shop primer and the proposed field primer. If primers are compatible, all surfaces shall be cleaned in conformance with the manufacturer's data sheet. If shop primer is not compatible, or damage to shop applied primer is too extensive for field touch-up, the surfaces shall be sandblasted in conformance to the surface preparation used in the shop.
- D. Shop Finished Ferrous Metal: Factory finished equipment or materials which have suffered damage to the shop applied coatings during shipment or installation shall be roughed-up in the field. All surfaces shall be cleaned in conformance with SSPC Section SP2 and touch-up shall be performed with paint supplied by the manufacturer.

SECTION 09 90 00 - PAINTING

- E. Immersion Service Ferrous Metal: Surfaces shall be sandblasted to a "Near White Clean" SP10 before application of the primer.
- F. Non-Ferrous Metal: Surfaces to be painted shall be cleaned in conformance with SSPC Section SP1 (Solvent Cleaned).
- G. Galvanized Metals: Galvanized surfaces to be painted shall be cleaned in conformance with SSPC Section SP1. Before application of the primer, surfaces shall be treated with one coat Koppers 40 Passivator (WF=4.0, DF=0.4).
- H. PVC Pipe: Surfaces shall be cleaned in conformance with SSPC Section SP1, except hand sanding shall be used to roughen the surface.
- I. Pipe with Factory Applied Bituminous Coatings: All exposed ductile iron pipe shall be painted. Bituminous coating shall be removed by sand blasting to near white before application of primer.
- J. Gypsum Wall Board: Cut out scratches, cracks, and abrasions in surfaces and openings adjoining trim and fill with approved filler. Bring filler flush with adjoining surfaces and when dry, sand smooth.
- K. Masonry: Surfaces shall be reasonably smooth and free of voids, cavities, dirt, dust, oils, grease or other contaminants.
- L. Concrete: Sweep sandblast to provide a surface profile. Allow concrete to cure for 28 days prior to painting.

3.03 COATING SYSTEMS APPLICATION

- A. All coatings shall be applied in strict accordance with the manufacturer's printed instructions and recommendations.
- B. All coatings shall conform to the film thicknesses as specified in Part 2 of this section. Coatings failing to meet the minimum dry film thickness shall be given additional coats until the minimum film thickness is attained.
- C. Undercoats shall be tinted similar to the finish coats. Each coat shall be slightly darker than the preceding coat.
- D. Each coat applied shall be inspected and approved by the Engineer before application of the succeeding coat.
- E. Allow each coat to dry thoroughly before applying the next coat.

SECTION 09 90 00 - PAINTING

- F. Finish coats shall be uniform in color and sheen without streaks, laps, runs, sags or missed areas.

3.04 CONTRACT CLOSE-OUT

- A. The Engineer shall make a detailed inspection of the paint work upon completion. All damage to surfaces resulting from the work of this section shall be cleaned, repaired or refinished as necessary, at no cost to the Owner.
- B. Upon completion of the work, all paint equipment and materials shall be removed from the site. Coating or paint spots, oil or stains upon adjacent surfaces shall be removed and the job site cleaned.

3.04 COLOR REQUIREMENTS

- A. All exposed piping (except stainless steel) is to be painted. Piping color charts are to be submitted for Owner review. Piping to be painted per the following color scheme:

EXPOSED PIPE COLOR REQUIREMENTS	
Water	Blue

- B. All exposed piping to be labeled with industrial grade water & UV resistant labels. In addition, all exposed piping to have direction of flow arrows with similar industrial grade stick-on labels. Coordinate all labels and arrows with the Engineer. Contractor to provide labeling walk-through with Owner and Engineer, and pipe labeling acceptance is required prior to Substantial Completion.

END OF SECTION

SECTION 10 52 00 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Work includes: Furnishing and installation of all fire extinguishers and cabinets as shown on drawings.
- B. Coordination: Verify that fire extinguisher cabinets are sized to accommodate fire extinguishers of type and capacity indicated.

1.02 SUBMITTALS

- A. Product data: Submit product data for each type of product included in this section. For fire extinguisher cabinets include roughing-in dimensions and details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, and panel style and materials.

PART 2 - MATERIAL

2.01 PRODUCTS

- A. Manufacturer: J.L. Industries, Bloomington, Minn. Extinguisher: Model Cosmic 5 E, UL rating 2A-10BC. Standard red finish.
- B. Mounting brackets: Provide manufacturer's standard brackets designed to prevent accidental dislodgment of extinguisher, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install according to manufacturer's recommendations, providing adequate anchorage into material encountered. Comply with applicable regulations of governing authorities.
- B. Install all fire extinguisher devices where shown in the Drawings and in the approved shop drawings, anchoring all components firmly in place.

SECTION 10 52 00 - FIRE EXTINGUISHERS

- C. Upon completion of the installation, and as a condition of its acceptance, visually inspect all the work under this section, check all components for proper operation and touch up all scratches and abrasions to be completely invisible. Each extinguisher shall bear inspection tag.

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

SECTION 15 40 00 – MISC. PLUMBING

PART 1. GENERAL

1.01 SYSTEM DESCRIPTION

- A. Providing and installing miscellaneous plumbing for exterior purposes only as described herein and shown on plans,

1.02 SUBMITTALS

- A. Submittals: Shop Drawings and Product Data.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with Uniform Building Code (UBC), Uniform Plumbing Code (UPC), and City of Ferndale Standards.

PART 2. PRODUCTS

2.01 MATERIALS

- A. Sanitary Drains:
 - 1. Soil and Waste Piping Above Ground: ABS Drain Waste Vent (DWV).
 - 2. Soil and Waste Piping Below Ground: ABS Drain Waste Vent (DWV).
- B. Unions: Provide at each pipe connection to equipment and fixtures, and where necessary to disconnect piping for repairs. Match pipe in which installed.
- C. Cleanouts: Provide at all locations required to clean piping, including end of main drain, base of all vertical stacks, at crosses, and elsewhere as required by codes and ordinances. Full size of piping served, accessible for use with conventional cleaning equipment. Provide brass lugs, with graphite lubricant on threads.
- D. 1" Yard Hydrants: 1" inlet yard hydrant with stainless steel operating rod, stainless steel pipe, automatic draining, equipped with backflow preventer, and all carbon steel components (if any) protected with fusion epoxy coating. Also, yard hydrant to be frost proof with 3/4" male hose threads. Provide with threaded vacuum breaker attachment (Smith Cooper International Model #0190167II, or equal). Yard Hydrant to be non-freezing style with 4' bury depth, Woodford Iowa Model Y2, Merrill CV-1000, or equal.

PART 3. EXECUTION

3.01 INSTALLATION

- A. Slope drainage lines 1/4 inch per foot or as required to meet code.
- B. Provide accessible cleanouts as required by code.
- C. Install in accordance with Manufacturer's instructions and as per local codes and ordinances

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

SECTION 23 34 00 - WALL FANS & LOUVERED VENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Work includes providing and installing the following (as noted herein and shown on the drawings):
 - Wellhouse: one 2,000 CFM Wall Fan (wall fan to be controlled by an individual thermostat), one motorized 48"x48" louvered vent (vent is to open if fan is powered 'ON'; both vents to remain open until both wall fans are powered 'OFF'), and one manual 24"x24" louvered vent.
- B. Wall fan shall be installed with a gravity combination louver with stainless steel insect screen. In addition, a minimum MFR warranty of 2 years is required.

PART 2 - MATERIALS

2.1 WALL FANS

- A. 2000 CFM Wall Fans (Nominal Unit Size = 24" x 24")
 - 1. Manufacturer: Acme Engineering & Manufacturing Corporation (or equal)
 - 2. Distributor: Coast Products, Inc., (800) 735-7026 (or equal)
 - 3. Type: Model # FQ18G6, 2,000 CFM, 1/2 HP Fan, 120V, single phase, with wall collar accessory and guard on back side of fan. 12 sones noise level (max).
 - 4. Operation: Wall fans to be single speed and thermostat controlled. Include motor side guard & wall collar (for all fans).
 - 5. Thermostats: Schaffer model T115, wall mounted with a 1 speed control that can be used for cooling with single speed fan motors. 40F to 100F temperature range dial. All thermostats are to be housed in a NEMA 4X enclosure, to be provided with stainless steel coil sensors, and to be located 4' above floor elevation.
- B. Gravity Combination Louvers
 - 1. Manufacturer: Louvers & Dampers, Inc. (or equal)
 - 2. Distributor: Coast Products, Inc., (800) 735-7026 (or equal)
 - 3. Type: EBE445, with combination backdraft damper and stationary louver (aluminum), size to match each fan individually (approximate dimensions = 24" x 24" for each 3000 CFM fan). Provide with wall collar accessories and channel frame, unless Contractor prefers otherwise.

2.2 LOUVERED VENTS

- A. Motorized Louvered Vents
 - 1. Manufacturer: Pottoroff (or equal)
 - 2. Distributor: Coast Products, Inc., (800) 735-7026 (or equal)
 - 3. Type: EXD-645 combination louver/damper, 48" wide x 48" tall with fixed drainable blades and integral damper with vinyl blade and jamb seals. Include removable/washable stainless steel insect screens – mesh 18 x 16. Include low leakage jamb seals for all units. Provide with channel frame, unless Contractor prefers otherwise. Include all options for automatic operation. Provide with non-protruding actuation system, no obstructions are to protrude into the room.

SECTION 23 34 00 - WALL FANS & LOUVERED VENTS

4. Operation: Automatic louver/damper operation by electric actuator, Pottoroff Model AF120, 120 V, spring return actuator which will power open damper(s) when pre-set thermostat setting is reached. Control to be from auxiliary contact(s) with associated wall fan thermostat(s) in same room.
- B. Manually Operated Louvered Vent
1. Manufacturer: Pottoroff (or equal)
 2. Distributor: Coast Products, Inc., (800) 735-7026 (or equal)
 3. Type: EXD-645 combination louver/damper, 24"x24", with fixed drainable blades, integral damper with vinyl blade and jamb seals. Size as noted in summary. Include removable/washable stainless steel insect screens – mesh 18 x 16. Include low leakage jamb seals for all units. Provide with channel frame, unless Contractor prefers otherwise. Include all options for manual operation. Provide with non-protruding actuation system, no obstructions are to protrude into the room.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Deliver vents in manufacturer's original, unopened cartons. Store in a safe place until ready for installation.
- B. Follow manufacturer's printed instructions for installation.
- C. Remove all identifying marks, labels, etc. from exterior.
- D. Install controls for all fans at 4' above floor.

END OF SECTION

SECTION 23 36 00 – ELECTRIC HEAT PUMP WALL UNITS

PART 1 - GENERAL

1.01 SUMMARY

- A. Work includes providing and installation of two (2) heat pump through-wall units with integral programmable thermostats in the following location (as described herein and shown on the drawings):
- Shop Well #2 Wellhouse

PART 2 - MATERIALS

2.01 HEAT PUMP WALL UNITS

- A. Heat Pump Wall Units (Packaged Terminal Air Conditioners – Heat Pump Model)
1. Manufacturer: LG, Carrier, or equal.
 2. Type: LG model #LP 153HD3B, 30 Amp, 14,900 Btuh Cooling Capacity, 13,200 Btuh Heating Capacity, EER of 11.2, 208 V, 1 phase.
 3. Each unit to include chassis with front panel, 30 amp power cord, manufacturer's mounting kit, insulated polymer wall sleeve, anodized aluminum architectural outdoor grille (louvered), accessory subbase kit, manufacturer's integral programmable thermostat, and manufacturer's Corrosion Protection features - including all exposed steel components to be painted, coated aluminum fins with copper tubing, stainless steel tube sheets (outdoor coil), totally enclosed fan motor with moisture resistant windings. Each unit to be securely attached and installed per manufacturer's recommendations. Include condensate drain kit and aluminum grille.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Deliver heat pump units in manufacturer's original, unopened cartons. Store in a safe place until ready for installation.
- B. Follow manufacturer's printed instructions for installation.
- C. Remove all identifying marks, labels, etc. from exterior.
- D. Condensate drain is to be routed outside and daylighted.

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

SECTION 23 50 00 – ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Work includes providing and installing one 5 kW electric unit heater and wall mounted thermostat as shown on the plans and described herein. Heater is to be mounted to the wall as discussed below.
- Shop Well #2 Wellhouse: one 5,000 W heater

PART 2 - MATERIALS

2.01 ELECTRIC UNIT HEATERS

- A. 5 kW Electric Unit Heater
1. Manufacturer: TRANE
 2. Type: TRANE Model #UHEC-053DACA, 5kW, 400 CFM airflow, 17,100 Btu/hr, 480V/3ph, 24V control transformer, contactor for 24V control circuits, and individually adjustable outlet louvers.
 3. Mounting Bracket: TRANE Horizontal wall/ceiling swivel bracket.
 4. Wall-Mounted Room Thermostat: Provide Model UHEC thermostat, rated for adjustable temperature range of 45F to 90F. Thermostat to control electric heaters.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Deliver products in manufacturer's original, unopened cartons. Store in a safe place until ready for installation.
- B. Follow manufacturer's printed instructions for installation.
- C. Remove all packaging labels, marks, etc. from exterior.
- D. 5 kW heater units to be mounted to the wall at an elevation of 7.5' +/- above floor elevation (nominal height). Confirm no conflicts with other appurtenances (piping, panels, etc.). Field adjust, if needed.
- E. Thermostat to be located 4' above floor elevation.
- F. Coordinate final locations (unit heaters and thermostats) with Owner prior to installation.

END OF SECTION

SECTION 26 00 10 – BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Work Included: The Contractor shall perform all the Work required (including the furnishing of all supervision, labor, services, tools, materials and equipment and the performance of all operations and incidentals necessary) for a complete, safe and reliable electrical installation, adjusted, tested and ready for operation. The electrical work is generally described as follows:
 - 1. Scheduling and coordination of all phases/sequences of the project.
 - 2. Maintaining, modifying, and temporary work to accommodate all phases/sequences of the project.
 - 3. Demolition
 - 4. Locating of existing underground objects; including power, telephone, cable television, water, sewer, natural gas, etc. (owner and utility owned).
 - 5. Electric service to point of connection with Puget Sound Energy Co. (including all necessary coordination with the utility and trenching, backfilling, etc.).
 - 6. Power (normal and standby) distribution system including meter base, C.T. enclosure, Motor control center, feeders, panelboards, circuit breakers, transformers, disconnects, etc.
 - 7. Engine generator set and automatic transfer switches and all appurtenances. The owner will provide fuel, except, contractor shall coordinate delivery.
 - 8. Engine generator set concrete pad.
 - 9. Temporary relocation and reconnection of existing engine generator set for Shop Well #1.
 - 10. Replacement of existing automatic transfer switch for Shop Well #1.
 - 11. Grounding.
 - 12. Wiring devices.

SECTION 26 00 10 – BASIC ELECTRICAL REQUIREMENTS

13. Lighting fixtures.
14. Lighting controls and devices.
15. Branch circuit wiring system for lighting, outlets, equipment, controls, etc.
16. Disconnecting means, switches, receptacles, motor starters, control devices, etc. (installation only, if furnished with the equipment), and final power and line voltage (120 volt or greater) control connections to equipment and devices provided by the Owner, General Contractor or other Sub-Contractors, including the following:
 - a. HVAC equipment, and their line voltage control devices,
 - b. Pumping systems equipment, and their line voltage control devices,
 - c. Heat tape and freeze protection.
17. Variable frequency drives, starters, contactors, relays, etc.
18. Process Control and Instrumentation Systems (PCIS), including telemetry panel, motor control center, instrumentation, modification of existing and integration into the City's SCADA system.
19. Control and instrumentation circuit raceways, wiring, boxes and devices.
20. Security devices and intrusion door contacts.
21. Fire alarm, raceways, wiring, boxes & devices.
1. Telecommunications (SCADA, telephone/voice, computer/data, etc.) patch panels, terminal blocks, outlets, jacks, fiber, cables, raceways, boxes & devices.
22. Installation of line voltage electric heaters and thermostats.
23. Supports.
24. Pull strings and ropes.
25. Trenching and backfilling for underground electrical work.
26. Handholes.
27. Cutting and patching, core drilling, etc.
28. Moisture, fire and dust stopping and sealing.
29. Temporary construction power.
30. Testing and completing.

SECTION 26 00 10 – BASIC ELECTRICAL REQUIREMENTS

31. Final cleaning.

32. Obtaining and paying for all required licenses, permits, inspections, plan review fees and any other fees.

D. Work not included: The following electrical system related work will be provided by the Owner, General Contractor or other Subcontractors:

1. General Contractor: Well Pump, See Civil specification sections and drawings.

2. Mechanical Contractor: Mechanical equipment, heaters, AC units, exhaust fans, devices. See mechanical specification sections and drawings.

3. Owner Integrator: The owner's integrator will provide programming of telemetry panel and integration into the City's SCADA system.

1.03. EXISTING CONDITIONS

A. Before submitting bid, examine existing site conditions to determine effect on execution of the electrical work and include costs in bid.

B. Existing devices, circuits, conduit, wiring, etc. indicated on the plan are based on site verification and are shown for diagrammatic purposed only. The contractor shall expect that an extensive amount of circuit tracing to determine how the actual circuits are installed will be required.

C. Underground utilities (electrical, water, sewer, cable television, etc.) are known to exist in the area of construction. The location of existing utilities shown on the drawings is approximate only and is not guaranteed to be an indication of all utilities in the area. The contractor is responsible for contacting the Owner and all utility companies and for field location of all utilities prior to construction. The one-call number for underground utility location services is 811. The Contractor shall promptly notify the Engineer of any conflicts between the contract documents and field location of existing utilities. The Contractor is responsible for maintaining the integrity of all existing utilities during construction.

D. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.

E. Restore site soils and plantings in trenching and backfilling areas and extend site restoration into adjoining areas to remain in a manner that eliminates evidence of trenching and backfilling.

1.04. SPECIAL AREAS

A. The entrance to the police station shall be kept clear to maintain access through back gate.

SECTION 26 00 10 – BASIC ELECTRICAL REQUIREMENTS

1.05. PLAN REVIEW AND PERMITS

- A. The Contractor shall arrange for inspections and pay for all required licenses, permits, inspections, and any other fees.

1.06. DEFINITIONS

- A. The term "Contractor" used throughout Division 26 of these specifications and on the electrical drawings shall be understood to mean the Electrical Contractor. All other work shall be called out by name.
- B. "Approved" means approved by the Engineer. "For approval" means for the Engineer's approval.
- C. "Furnish" means to supply and deliver to the Project, ready for installation and in operable condition.
- D. "Install" means to incorporate in the work in final position, complete, anchored, connected, and in operable condition.
- E. "Provide" means furnish and install.
- F. "As directed" means as directed by the Engineer.
- G. "Concealed" means hidden from sight in trenches, walls, chases, ceilings, etc.
- H. "Exposed" means within sight; that is, not concealed as defined above, and installed on the surface of walls, ceilings, etc.
- I. "C.O." means conduit only; that is, without cable (except, provide pull string or rope).
- J. "F.O.I.C." means Furnished by Others (e.g. general contractor, other subcontractors, equipment suppliers, Owner, etc.), Installed by Electrical Contractor.
- K. Definitions of all other terms, etc. are in accordance with AIA, ANSI, IEEE, IES, NEMA, etc. standard definitions.

1.07. DRAWINGS & SPECIFICATIONS

- A. The electrical plan drawings are general in form and do not attempt to show complete details or list every item of the electrical systems, the building construction or the various equipment; however, the routing of raceways and circuits, and the locations of equipment, devices, fixtures, etc. represent the desired finished arrangement; except, as governed by structural or mechanical conditions or obstructions.
- B. Specifications are, in some cases, written in an abbreviated form. Words such as shall, shall be, the Contractor shall, and similar mandatory phrases are supplied by inference.

SECTION 26 00 10 – BASIC ELECTRICAL REQUIREMENTS

- C. Investigate the structural and finish conditions affecting the work. Refer to the civil, structural and mechanical drawings, supplier shop drawings and submittals, etc. for additional details, equipment ratings, dimensions, location and swing of doors, location and size of partitions, cabinets, etc. and similar features. Verify all dimensions, equipment ratings, etc. with the actual before installation. Arrange the work accordingly.
- D. The intent of the drawings and specifications is to include all items necessary for the proper execution and completion of the Work; however, any item or detail not specifically mentioned in the specifications or shown on the drawings, but which is necessary to produce the intended results shall be included.
- E. The Contractor shall bring to the Engineer's attention any discrepancies, inconsistencies, conflicts, errors, or omissions within the Contract Documents, between the Contract Documents and field conditions, and any design and layout changes required due to specific equipment selection, etc. prior to equipment and material purchasing and installation. If Contractor purchases any equipment or materials and performs any construction activity, and it knows or reasonably should have known that the documents contain a discrepancy, inconsistency, conflict, error or omissions, corrective work shall be at the Contractor's expense.
- F. In the event that there are discrepancies between requirements shown on different sheets of the drawings or between the drawings and the specifications, the more restrictive of the requirements shall apply.
- G. Verify all equipment and device locations with the Owner and Engineer prior to rough-in
- H. Verify exposed conduit routing with the Owner and Engineer prior to rough-in.

1.08. SUBMITTALS

- A. Submittals from the electrical contractor and each sub-contractor shall include a cover page indicating the company name, project manager name, and contact information for the contractor.
- B. Forward all submittals to the Engineer, together in a complete package, at one time, in electronic format as single .pdf files for each specification section. Submittals for individual products or incomplete submittals are not acceptable and will be returned without review.
- C. Submittals shall be grouped by specification section and shall be arranged in the same order in which they are found in the specifications to facilitate the review process.
- D. Re-submittals, when requested, shall be provided as complete and comprehensive for each specification section. Re-submittals for individual products or incomplete re-submittals are not acceptable and will be returned without review.
- E. Provide submittals for the equipment, boxes, devices, fixtures, special raceways, systems and their components, etc. as directed in the various sections of the specifications.
- F. Prepare detail layout drawings to a larger scale than the contract drawings in areas where the work is of sufficient complexity to warrant additional detailing.

SECTION 26 00 10 – BASIC ELECTRICAL REQUIREMENTS

- G. Submittal drawings shall be on standard size sheets no larger than the contract drawings.
- H. Submit M.S.D.S. (Manufacturer's Safety Data Sheets) for all chemicals or hazardous materials. All chemicals and hazardous materials to meet NIOSH Permissible Exposure Levels (P.E.L.) and OSHA Time Weighted Average (T.W.A.) requirements before commencing work.
- I. If requested by the Owner, provide samples of materials for evaluation.
- J. Submittals shall provide sufficient detail so compliance with the drawings and specifications can be ascertained. Clearly identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and review materials and equipment.
- K. Catalog pages containing more than one product shall be marked with arrows to indicate the proposed product.
- L. Obtain approval before purchasing any products. Items not in accordance with the drawings and specifications will be rejected.
- M. The Contractor shall establish quantities, check drawings and data, verify space requirements, dimensions, and possible interferences prior to submittal. Submittals which indicate quantities will not be reviewed by the Engineer for accuracy of quantity.
- N. The Engineer will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility. Approval of submittals does not release the Contractor from a proper installation, compliance with the drawings, specifications, codes, standards, etc. or coordination of the work.
- O. Approval of submittals does not release the Contractor from a proper installation, compliance with the drawings, specifications, codes, standards, etc. or coordination of the work.
- P. Allow two weeks turnaround time for each submittal from the time of receipt at the engineer's office, except the engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until the related submittals are received.

1.09. SUBSTITUTE PRODUCTS APPROVAL

- A. During Bidding:
 - 1. Substitutions for equipment and materials other than that specified will be considered if equal (or better and/or higher) in quality, ratings and function; and similar in type, style, size and appearance.
 - 2. Submit written requests to Owner and Engineer.
 - a. If received no later than 7 work days prior to Bid opening, requests will be considered, but not thereafter.

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- b. Bidders will be informed by Addendum of any approved items.
- c. No responses will be provided for rejected items.
- 3. Requests shall be accompanied by complete specifications, samples, record or performance, certified tests by impartial, recognized laboratories, and other such information as required to clearly represent the proposed substitution.
- 4. Engine-generator set substitution requests shall include calculations to verify engine-generator set will start and run loads as listed in the panel schedules.
- 5. Final decisions as to quality and suitability of proposed substitutions rest solely with the Owner and Engineer and will be based on proof submitted.
- 6. The cost of changes required in order to incorporate the proposed substitution, such as revisions to controls, raceways, wiring, openings, appurtenances, etc., shall be included in the bid. Any cost reduction resulting from substitutions shall benefit the Owner through a reduced bid.
- 7. When Owner and Engineer approve a proposed substitution, it is with the understanding that Bidder certifies that substitute articles or materials are equal to or better than those specified and that no exception is taken with any of the performance objectives, service or warranty requirements or features herein specified.

B. After Bidding:

- 1. Substitute products requests will not be considered.

1.10. RECORD DOCUMENTS

- A. Submit record documents at completion of the project in accordance with the specific submittal requirements listed elsewhere in these documents.
- B. Provide “as-built” drawings in both full size reproducible form and in software form as AutoCAD .dwg type files.
- C. All record documents in software form shall be provided on a single CD-ROM. Include the necessary program(s) to read test results. Separate submittals for the various disciplines will not be accepted.

1.11. "AS BUILT" DRAWINGS

- A. The Contractor shall continuously maintain a marked job set of as-built drawings as the work progresses, to indicate deviations from the original design, including change orders. Maintain records of all concealed wiring and of actual equipment, device, etc. locations. Provide dimensions

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from accepted reference lines as needed. The as-built drawings shall be kept on-site and available for inspection by the Owner.

- B. Include any detailed equipment, raceway, wiring, etc. diagrams and layouts prepared by Contractor or his subcontractors, suppliers, etc.
- C. At substantial completion, Contractor shall modify one complete set of reproducible copies, with all "as built" information and submit these drawings to the Owner for approval. Each sheet shall be marked "CORRECTED TO AS BUILT"; or, if there are no changes, drawings shall be marked "NO CHANGES, INSTALLATION PER PLAN".
- D. After approval, Contractor shall transfer all "as built" information from the marked job set and other information as appropriate to AutoCAD or AutoCAD LT .dwg type files. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor.) Utilize the layering scheme, font types, line types, title block, etc. provided in the AutoCAD drawing files. All drawings shall be noted as "As-Built" with a stamp and date. After adding the "as-built" information, return the AutoCAD files to the Consultant/Engineer for inclusion into the final project record set.
- E. "As-built" drawings for all portions of the work shall be combined into a single set matching the contract documents. Separate submittals for the various disciplines will not be accepted.

1.12. OPERATION AND MAINTENANCE MANUALS

- A. Following installation of the electrical systems, but prior to acceptance of the work, Contractor shall submit to Engineer one loose-leaf volume with information systematically segregated and indexed for easy reference to be reviewed by the Owner and Engineer. This submittal copy will be returned to the Contractor, and the material can be used in preparation of final volumes. After approval of preliminary copy, but prior to project completion, submit 3 finished copies.
- B. Format shall be 8½" x 11" size with neat, clean copies, drawings (accordion folded), etc. Manuals shall have a typewritten index, and divider sheets with identification tabs between categories. Manuals shall be in hard cover 3 ring binders with titles permanently embossed on the cover face and the spine. The front of each volume shall be imprinted with the project name, title (e.g. "Electrical Equipment and Devices Operating Instructions and Maintenance Manual"), Owner, Electrical Engineer and Contractor.
- C. Manuals shall include:
 - 1. Record documents (see above).
 - 2. Submittals, updated to "as built" conditions.
 - 3. Test results; except, telecommunications equipment, cables, etc. test results shall be in a separate binder.
 - 4. Description of systems configuration and operation including component identification and interrelations, including diagrams and supplementary drawings where necessary.

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5. Installation, operation, maintenance and programming manuals covering the installed systems, equipment and materials.
6. Maintenance instructions (frequency of service, type of service, etc.).
7. Parts lists for all equipment; including recording information, recommended spares and anticipated useful life.
8. Supplier's names, addresses, telephone and reference order numbers for all equipment and materials.
9. Warranties and Bonds.
10. Copies of final inspection certificates from the authorities having jurisdiction.

D. Omit non-applicable data.

1.13. WARRANTY

- A. The complete installation shall be guaranteed for a period of one (1) year after date of project completion. For warranty purposes, the date of project completion shall be considered the date of final acceptance of the installation by the Owner certified in writing, and after Owner has received all project close-out requirements. All corrective work, if needed and requested by the Owner, shall be provided without cost to the Owner during the guarantee period.
- B. All corrective work performed by the Contractor in remedying defective work during the guarantee period following the Owner's acceptance of the project shall be subject to the same guarantee requirements of the original work for a period as specified from the date of completion of the corrective work.
- C. Corrective work shall include on-site service by the Contractor, subcontractor or supplier (e.g. control systems, etc.), and/or nearest technical service representative of the equipment manufacturer. Service shall be provided within 24 hours from the time of request for warranty service by the Owner.

1.14. TRAINING/INSTRUCTION AND ASSISTANCE

- A. After the installation is complete and operating, and prior to acceptance of the work, conduct a minimum of a one (1) hour training/instruction period at the site to point out locations of service and maintenance and instruct the Owner's in the operation of all systems and equipment.
- B. The person(s) who conduct these instructions and demonstrations shall be a qualified representative(s) of the manufacturer with substantial training and operating experience on this equipment and project, and shall be versed in the operating theory as well as practical operation and maintenance work. Instructor(s) shall have the necessary educational and interpersonal skills,

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as well as proven ability to effectively perform the training. Their qualifications shall be submitted to the Owner before conducting the instruction period.

- C. Each period shall include preliminary discussion and presentation of information using the actual maintenance manuals required for this project. Contractor shall notify Owner and Engineer at least 48 hours in advance of readiness to conduct the instruction period. The actual time and date of instruction period shall be acceptable to the Owner and Engineer.
- D. All training material shall be furnished and supplied by the Contractor.

1.15. QUALITY ASSURANCE

- A. Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with the systems, equipment, devices, fixtures, materials, etc. and the required methods of installation.
- B. Contractor shall provide proof, upon request, that all personnel are licensed according to Washington State RCW.
- C. All materials, equipment and workmanship shall be properly inspected by the Contractor and shall at all times be subject to inspection by the Owner and Engineer. Contractor shall provide all samples, data and documents necessary for such inspection. Owner and Engineer shall be afforded full and free access at the jobsite and the shops and places of business of the Contractor for such inspection and to determine the status of the work. If Contractor covers all or any part of the work prior to any inspection or test specifically requested by Owner and/or Engineer, the cost of any necessary uncovering and replacing shall be borne by the Contractor.
- D. Neither the failure to make inspections or tests, nor to discover defective workmanship, materials or equipment, shall prejudice the rights of the Owner or Engineer thereafter to reject the work and/or require its correction.
- E. The completed installation shall comply with the more stringent of the requirements of the drawings and specifications, the authorities having jurisdiction, and all laws, ordinances, rules, regulations and requirements in effect at the site, including current editions of the following:
 - 1. NEC - National Electrical Code.
 - 2. National Electrical Safety Code.
 - 3. OSHA - Occupational Safety and Health Act (and its Washington State equivalent).
 - 4. ADA - Americans with Disabilities Act (and its Washington State equivalent).
 - 5. International Fire Code (and its Washington State equivalent).
 - 6. International Building Code (and its Washington State equivalent).
 - 7. Washington State Rules and Regulations for Installing Electrical Wires and Equipment (WAC 296-46).
 - 8. Washington State Safety Standards for Electrical Workers (WAC 296-45).
 - 9. Washington State Non-Residential Energy Code (NREC).
 - 10. Washington State "Excavation, Trenching and Shoring" law.

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- F. The following standards establish the minimum requirements for the equipment and installation, unless exceeded by the requirements of the drawings or specifications:
1. ANSI - American National Standards Institute.
 2. BICSI – Building Industry Consulting Service International
 3. ICEA - Insulated Cable Engineers Association.
 4. IEEE - Institute of Electrical and Electronics Engineers.
 5. NEMA - National Electrical Manufacturers Association.
 6. NEIS – National Electrical Installation Standards
 7. NFPA - National Fire Protection Association.
 8. NECA – National Electrical Contractors Association
 9. EIA - Electronic Industries Association.
 10. TIA - Telecommunications Industry Association.
- G. In addition, telephone/voice & computer/data pathways & wiring shall be in accordance with the following:
1. ANSI/NECA/BICSI 568 – Installing Commercial Building Telecommunications Cabling.
 2. ANSI/TIA/EIA 526 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 3. TIA/EIA TSB-125 – Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning.
 4. TIA/EIA TSB-140 – Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 5. ANSI/TIA/EIA 568 – Generic Telecommunications Cabling for Customer Premises.
 6. ANSI/TIA/EIA 568 – Commercial Building Telecommunications Cabling Standard.
 7. ANSI/TIA/EIA 568 – Balanced Twisted Pair Telecommunications Cabling System Standard.
 8. ANSI/TIA/EIA 568 – Optical Fiber Telecommunications Cabling System Standard.
 9. ANSI/TIA/EIA 568 – Broadband Coaxial Cabling and Components Standard.
 10. ANSI/TIA/EIA 569 – Telecommunications Pathways and Spaces.
 11. ANSI/TIA/EIA 570 – Residential Telecommunications Cabling Standard.
 12. ANSI/TIA/EIA 598 – Optical Fiber Cable Color Coding.
 13. ANSI/TIA/EIA 606 – Administration Standard for Commercial Telecommunications Infrastructure.
 14. ANSI/TIA/EIA 607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.
 15. ANSI/TIA/EIA 758 – Customer-Owned Outside Plant Telecommunications Cabling Standard.
 16. IEEE 802.3-2002 – IEEE Standard for Information Technology, Part 3: CSMA/CD.
- H. Nothing in the drawings or specifications shall be construed to direct or permit work not conforming to applicable laws, ordinances, rules, regulations, requirements or standards. Discrepancies or conflicts shall be brought to the attention of the Owner and Engineer promptly for resolution.
- I. The Owner and Engineer shall be advised whenever an inspection is requested. Any materials, equipment or workmanship that is not (in the opinion of the Owner, Engineer or Inspector) as it should be, shall be taken out and replaced without cost to the Owner.

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PART 2 - PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system.
- B. Contractor shall make certain that all materials selected by him, his subcontractors or by his suppliers, conform exactly to requirements of the drawings and specifications. Transmittal of such specifications and drawing information to subcontractors, person manufacturing and/or supplying materials to the project, and rigid adherence thereto, is the Contractor's responsibility.
- C. All equipment, devices, fixtures, materials, etc. shall be UL (Underwriter's Laboratories, Inc.) listed, labeled and approved for the service intended where UL standards have been established. If no UL label is available, the label of a testing agency or conformance to national standards recognized and approved by the electrical inspector having jurisdiction is required.
- D. All equipment, devices, fixtures, materials, etc. shall be new and installed only if in first class condition.
 - 1. Unless specifically designated as existing.
 - 2. Existing raceways, boxes, etc. may be re-used if in "like new condition" and appropriate for the new installation.
- E. All equipment, devices, etc. and their components shall be designed for continuous duty without degradation of function or performance.
- F. In the event that any item is not available exactly as specified, the Contractor shall so notify the Owner and Engineer in writing prior to bidding as early as possible to allow ample time for an alternate item to be selected without delay to the project.

2.02. EQUIPMENT MANUFACTURERS

- A. Unless specifically noted otherwise, all references to manufacturer's or supplier's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.
- B. All equipment, devices, materials, etc. shall be of a type manufactured by reputable recognized vendors. Each type or groups of items, system components, etc. having the same or similar function shall be the same manufacturer, make and quality throughout the facility.
- C. Approval of a manufacturer's name and/or type does not release the Contractor of the responsibility for providing materials which comply in all details with requirements in the contract documents.

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2.03. SPARE CAPACITY

- A. Unless sizes and/or quantities are specifically indicated, provide at least 20% spare wiring capacity in all cabinets, panels, cable trays and raceways.

2.04. ENCLOSURES

- A. Unless otherwise noted, equipment, devices, luminaires, boxes, etc. located indoors shall have general purpose (NEMA 1) enclosures, except:
- B. Equipment, devices, luminaires, boxes, etc. located outdoors shall be provided with weatherproof (NEMA 3R) enclosures. Surface finish shall be a rust inhibiting primer followed by an epoxy or polyurethane polyester top coat.
- C. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc.
- D. Enclosures and boxes shall be fabricated from code gauge, or heavier, galvanized steel. Surface preparation and finish shall be manufacturer's standard unless noted otherwise.
- E. Include all necessary mounting, etc. accessories.

2.05. SUPPORT CHANNEL

- A. Channel, framing members, etc. shall be 12 gauge steel, galvanized, 1⁵/₈ inch channel width with all necessary accessories.
- B. Threaded rod shall be steel, minimum ³/₈ inch diameter.

2.06. ANCHORS AND FASTENERS

- A. Anchors and fasteners used shall be of a type designed for use in the base material to which the item is to be attached. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- B. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.
- C. Powder actuated fasteners, plastic expansion type anchors, nails and toggle bolts are not permitted.
- D. Anchors shall be non-corrosive or have suitable corrosion resistant coatings or treatment.
- E. Bolts, nuts, screws and other threaded devices shall have standard threads and heads, unless required for tamper-proof installation.

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2.07. IDENTIFICATION

- A. Provide nameplates for all equipment (e.g. switchboards, panels, disconnecting means, control panels, control stations, etc.) and other devices used for the control of circuits, equipment, etc. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. and include the panel and circuit number(s) from which it is fed. Nameplate designations shall be consistent with the project documents. Submit proposed inscriptions for approval.
- B. Provide nameplates for switchboards and panelboards to identify the system color coding scheme for phase and neutral conductors as required.
- C. Definite purpose devices shall be labeled with a description of the device's function, rating and include the panel and circuit number(s) from which it is fed.
- D. All equipment and outlets shall be labeled with the panel and circuit number(s) from which it is fed.
- E. Spare, C.O., etc. conduits shall be labeled with their destination.
- F. All non-underground medium voltage cables and conduits containing medium voltage cable shall be provided with suitable labels every 10 feet identifying the voltage of the cables and/or the cables within the conduits.
- G. Nameplates shall be laminated plastic, with lettering etched through the outer covering. Character size as appropriate for the application, approved by Engineer; ¼ inch minimum. Nameplates shall be securely fastened with suitable adhesive or self-tapping screws. Character and background colors shall conform to the following system color code:

<u>Background.</u>	<u>Char.</u>	<u>System</u>
Black	White	Power & Lighting
Orange	White	Emergency Systems
Red	White	Fire Alarm
Orange	White	Data Cabling & Equipment Systems*

* These are sub-systems of the general telecommunications distribution system. All cabling and equipment for the general telecommunications distribution system shall be identified with nameplates, etc. consistent with the data cabling and equipment systems (e.g. orange and white).

- H. Identification tags shall be plastic, flexible type with a label. Identification tags shall be securely fastened with cable ties. Tags shall be mounted so as to be clearly visible.
- I. Labels shall be heavy duty adhesive type, clear background with black letters on light colored devices and clear background with white letters on dark colored devices; except, labels on devices connected to the emergency power system shall have red letters. Lettering shall be appropriately sized for the application, ¼ inch minimum. Labels on ceiling mounted devices shall be large enough to read from the floor. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.

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PART 3 - EXECUTION

3.01. CONSTRUCTION/WIRING METHODS

A. Wiring methods shall be as follows:

1. Service - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and GRS conduit above grade.
2. Feeders - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and EMT above grade for interior and GRS above grade for exterior.
3. Branch circuits - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and EMT above grade.
4. Telecommunications - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and EMT above grade.
5. Control, security, etc. - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and EMT above grade.

B. All wire and cable shall be enclosed within the raceway system.

C. Conduit and cable shall be run concealed in the walls (including within CMU and similar construction) or below the floor with all devices, etc. flush mounted unless specifically approved or noted otherwise. Exposed conduit (where allowed) shall be run as neatly and unobtrusively as possible, parallel or at right angles to walls, ceilings, etc. to the approval of the Owner and Engineer.

D. Devices shall be flush mounted unless noted otherwise.

E. Equipment shall be surface mounted unless noted otherwise.

3.02. CONTRACTOR CONTROL AND SUPERVISION

A. Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the work in a skillful manner. Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work, unless the Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.

B. Performance of the work shall be directly supervised by a competent superintendent (and/or foreman) who is satisfactory to Owner and has authority to act for Contractor. The superintendent (and/or foreman) shall constantly supervise the work and check all materials prior to installation

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for conformance with the Contract Documents. The superintendent (and/or foreman) shall not be changed without the prior written consent of Owner.

- C. Contractor shall enforce strict discipline and good order among Contractor's employees and other persons performing the Work. Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. Contractor's employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons.
- D. Inappropriate activity or comments by Contractor, Contractor's employees and other persons performing the work will result in immediate removal from the site.

3.03. GENERAL

- A. The installation and demolition shall be done in a neat and workmanlike manner and shall be suitable for the location. Conduit stub-ups, sleeves and ends left open for future connection, unused hubs in fittings and unused holes in boxes shall be plugged or capped to prevent the entrance of moisture and debris.
- B. For the actual fabrication, installations, and testing, use only persons thoroughly trained, experienced and completely familiar with the items required and with the manufacturers' recommended methods of installation. In acceptance or rejection of the work, no allowance will be made for lack of skill or experience.
- C. The Contractor shall personally, or through a competent superintendent, constantly supervise the work and check all materials prior to installation for conformance with the Contract Documents.
- D. Circuits shall be run from equipment to equipment, outlet to outlet, fixture to fixture, device to device, etc. and all homeruns shall be run exactly as shown on the drawings unless permission is obtained from the Engineer to alter the arrangement.
- E. Changes in location (e.g. equipment and devices up to 10 feet, raceway routing, etc.) made before installation and deviations to avoid interferences shall be made without increase in Contract Sum.
- F. The Contractor shall conduct operations in a manner to avoid the risk of bodily harm to persons or damage to any property. Construction equipment and tools shall be in good operating condition and be designed to perform the work required. The Contractor shall continuously inspect all work to discover any unsafe conditions and be solely responsible for their correction.
- G. Use all means necessary to protect the equipment and materials and the work, materials, etc. of the other trades before, during and after installation. Do all cutting carefully to prevent damage to the work. Correct lifting, jacking and/or moving methods shall be used. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and Engineer without increase in Contract Sum.
- H. The Contractor shall provide all cutting, patching, core drilling, etc. as required for the work. Use only journeymen skilled in the necessary cutting or patching operation. Patching shall match adjacent work. Structural members shall not be cut without approval of the Engineer. Where

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penetrations in structural members for conduits, cables, etc. are allowed, the holes shall be no larger than absolutely necessary.

- I. The premises shall be kept free from the accumulation of rubbish and debris caused by the work.
- J. The Contractor shall provide all backboards, hangers, supports, chases, anchor bolts, inserts, sleeves and other openings in the construction required for the electrical work.
- K. Wall, ceiling and floor penetrations by raceways (both inside and outside the raceway), cables, etc. shall be sealed to maintain the original moisture, dust and fire resistance to the approval of the Engineer. Flash and counter-flash all roof penetrations.
- L. The Contractor shall move existing equipment, miscellaneous (office, storage, maintenance, etc.) objects and materials, and other building furnishings, attached or unattached, as required to perform the work, including returning the items to their original location in their original condition.

3.04. COORDINATION AND SCHEDULING

- A. The Contractor shall coordinate the work and cooperate with the Owner, other trades and System Contractors to have the work completed to the best advantage, insure there are no interferences, provide reasonable opportunity for the other trades and Contractors to complete their work and to not delay the work.
- B. The Contractor shall coordinate work to avoid disturbance to building operations and personnel, and to allow access for both persons to and within all portions of the facility and vehicles to the facility. Contractor shall coordinate and schedule with Owner a minimum of fourteen (14) days in advance and re-confirmed a minimum of 48 hours in advance, or as mutually agreed upon with Owner, to determine dates and times that access to the Contractor will be allowed.
- C. Any and all costs incurred for non-standard hours, double-shifts, overtime, etc. or any other costs associated with completing the project within the completion times required shall be included without increase in contract sum.
- D. The Contractor shall coordinate all phasing requirements with the Civil Engineer, General Contractor and Owner prior to performing the work. Contractor shall verify all demo work in each phase to ensure there are no interferences with the existing operations and functionality of the existing electrical, control, telemetry, etc. systems within the facility.

3.05. DELIVERY, STORAGE AND HANDLING

- A. All equipment and materials shall be stored neatly and out of the way. Conduit, fittings, cable, etc. shall be stored off the ground, protected from the weather in racks or bins or on shelves. Equipment, panelboards, fixtures, devices, etc. shall be stored indoors in a dry, warm area, free of dust and one in which condensation will not occur.

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- B. Ship equipment in its original package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer's recommendations and packing label instructions. Provide protective coverings during construction.
- C. Identify materials and equipment delivered to the site and storage organized to permit checking against approved material lists and submittals.

3.06. TEMPORARY POWER

- A. The contractor shall remove, relocate, and temporarily reconnect the existing Shop Well #1 Generator and sub-base fuel tank.
- B. The Contractor shall provide all temporary power services, facilities, equipment, devices, material, etc. required for the construction; including adequate lighting, outlets, balancing, testing, etc. as may be necessary for the proper performance and inspection of the work.
- C. The temporary power system shall be provided in a neat and safe manner, in compliance with governing codes and good working practice.
- D. The temporary power systems shall be removed when no longer required.

3.08. DEMOLITION

- A. Where existing walls and ceilings are to remain, Contractor shall remove all items indicated to be removed, and all associated equipment, devices, raceways, boxes, cables, etc. back to their point of origin and/or destination; except, concealed conduits & boxes may be abandoned in place and/or existing conduits and boxes may be re-used if in good condition and appropriate for the new installation, at the option of the Contractor.
- B. Where existing walls and ceilings are to be removed, Contractor shall remove all items, whether indicated or not, and all associated equipment, devices, raceways, boxes, cables, etc. back to their point of origin and/or destination; except, concealed conduits & boxes may be abandoned in place and/or existing conduits and boxes may be re-used if in good condition and appropriate for the new installation, at the option of the Contractor.
- C. Existing cables shall be removed or replaced. Provide pull strings in existing conduits being abandoned in place. Existing below grade conduits shall be cut off and capped flush with the floor. Existing concealed boxes shall be provided with suitable blank covers and/or wallplates.
- D. Label the ends of conduits abandoned in place with origin and destination description, and note locations on the as-built drawings.
- E. Where existing equipment, fixtures, devices, etc. are indicated to be replaced, remove and dispose of the existing and provide new in its place.

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- F. All existing telecommunications, fire alarm, class 2 low voltage, etc. cabling abandoned in the ceiling space, either as part of the work, or as a result of previous work, shall be removed from point of origin to destination.
- G. For all items indicated as to be removed or re-wired, Contractor shall remove all associated conduit, boxes, cables, etc. back to their point of origin &/or destination; except, concealed conduits & boxes may be abandoned in place &/or existing conduits & boxes may be re-used if in good condition & appropriate for the new installation, at the option of the Contractor. Existing cables shall be removed or replaced.
- H. Existing equipment, fixtures, devices, etc. to remain shall be protected as required during demolition and construction. In the event of damage, immediately make all repairs and/or replacements necessary to the approval of the Owner and Engineer without increase in Contract Sum.
- I. Existing equipment, fixtures, devices, etc. to be re-used in the new work shall be removed carefully, and protected as required during demolition and construction. In the event of damage, immediately make all repairs and/or replacements necessary to the approval of the Architect and Engineer without increase in Contract Sum.
- J. Items not indicated shall remain "as is"; except, shall be re-connected as required if its circuit is interrupted during the demolition.
- K. Holes, openings, etc. where existing raceways, cables, boxes, outlets, etc. are removed and not replaced shall be patched to match adjacent surface.
- L. All surplus materials removed during the demolition shall be inspected by the Owner and those items selected shall remain the property of the Owner. All remaining surplus materials shall be removed from the site and disposed of by the Contractor without increase in Contract Sum.

3.09. INTERRUPTIONS

- A. Power, fire alarm, telecommunications and other systems interruptions, whether to individual equipment or to the entire system, shall not be done without prior approval and scheduling with the Owner. Power, fire alarm and/or telecommunications interruptions required to facilitate construction work and that affect operation of the existing facility shall not be done during normal working hours. Some working of non-standard or longer than standard hours will be required, without increase in Contract Sum.
- B. As much as possible, items shall be pre-assembled and systems prefabricated to minimize the change-over time.

3.10. WORK SEQUENCE

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- A. In order to minimize the interruptions to the individual systems and equipment, and to keep maximum power available to the facility; the work shall, in general, be done following the work schedule and sequence.
- B. The existing site shall be maintained and modified for demolition, temporary and new work until the schedule calls for its removal and the new system is installed, tested and fully operational.

3.11. LOCATIONS

- A. Locations and mounting heights of equipment, devices, etc. shall be consistent, and in accordance with the requirements of NFPA, ADA and the authority having jurisdiction.
- B. Devices and associated wallplates shall be located so as to not span different types of building finishes.
- C. In general, surface raceways, cable trays, cable racks, etc. shall be mounted as unobtrusively as possible, tight against whiteboard trim, chair rails, in room corners, against ceilings, against chases, etc. and other breaks in the construction.
- D. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways. Obtain specific approval for the location of each from the Owner and Engineer before rough-in.
- E. Changes in location (e.g. equipment and devices up to 10 feet, trench and conduit routing, etc.) made before installation and deviations to avoid interferences shall be made without increase in Contract Sum.

3.12. EQUIPMENT, LUMINAIRES AND DEVICES

- A. Equipment, luminaires, devices, etc. shall be installed plumb and true, and shall be square with the adjacent walls, ceilings, structural members and other equipment; in a horizontal or vertical position as intended. The location of similar items shall be consistent.
- B. Equipment, cabinets, boxes, fixtures, devices, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- C. The correct lifting, jacking and/or moving gear which will prevent damage shall be used.
- D. All bolts, nuts, screws and other fastenings shall be tightened in accordance with manufacturers or listing instructions and all covers replaced on equipment and boxes. All electrical connections, particularly those on bus work in panelboards, etc. shall be checked to ensure tightness and electrical conductivity.

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- E. Follow manufacturer's installation and/or listing instructions and details where available. Provide all boxes, mountings, wiring or fittings required, standard or special.
- F. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc. Check for proper fit.
- G. Repair damaged corrosion protection and touch-up paint all scratched, marred or damaged factory finish on equipment, devices, fixtures, enclosures, etc.

3.13. SUPPORTS

- A. Provide all necessary supports, anchors, fasteners, and backing for all raceways, racks, boxes, enclosures, luminaires and equipment.
- B. Hangers and supports shall be made from standard structural shapes and hardware or systems of shapes, fittings and hardware designed for the purpose.
- C. Hangers and supports shall be adequately and safely attached to the building structure. Equipment or materials to be supported shall be securely fastened to the supporting means. Use size and number of attachments as required for a safety factor of at least four. In addition to the weight of the material, consideration shall be given to the weight of the support itself, the weight of materials within, vibration, external operational forces, shock load, etc.
- D. Brace all equipment, racks, etc. as required to meet the requirements of the International Building Code.
- E. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- F. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.

3.14. CORROSION PROTECTION

- A. All material and equipment shall have corrosion protection suitable for the atmosphere in which they are installed.
- B. Maintain the integrity of factory provided corrosion protection. Repair damaged corrosion protection and touch-up paint all scratched, marred or damaged factory finish on equipment, devices, luminaires, enclosures, etc.; per manufacturer's instructions where available.
- C. Paint field cuts with a suitable cold galvanizing compound.

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3.15. APPROVALS

- A. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways, cables, etc. Obtain specific approval for the location of each from the Owner and Engineer before rough-in.
- B. Prior to beginning installation of cables, obtain approval of the raceway installation from the Owner and Engineer.

3.16. CLEANING

- A. Remove trash, combustible material, and other debris from electrical rooms and areas around equipment.
- B. Remove shipping materials, supports, spacers, etc. from equipment, devices, etc.
- C. Remove all debris from equipment, devices, etc. including all scraps of wire, metal shavings, plaster, dust, and other foreign material.
- D. The top sides and interiors of all equipment and enclosures shall be vacuumed clean.
- E. The exterior of all equipment and enclosures shall be wiped down with a clean, dry, lint-free cloth or soft bristled brush.
- F. Clean screens, louvers, baffles, etc. covering ventilation openings to ensure they are clear.
- G. Remove paint splatters and other spots, dirt, and debris.
- H. Touch up scratches to match original finish.
- I. Remove all traces of soil, dirt, dust, smudges, fingerprints and other foreign matter from visible surfaces of equipment, devices, luminaires, etc. Pay close attention to highly finished surfaces such as glass and polished metals. Wipe lamps clean.
- J. Maintain adequate ventilation during cleaning.
- K. Follow manufacturer's instructions. Failure to follow manufacturer's recommendations when cleaning equipment can result in damage from the use of improper cleaning methods or agents.

3.17. VISUAL AND MECHANICAL INSPECTION

- A. Verify that all equipment and their components are sized properly for the load and the types, sizes, etc. are in accordance with the contract documents, approved submittals, etc.
- B. Visually inspect equipment for physical damage. Repair physical damage, if practical and approved by the manufacturer. Consult Owner, Engineer and manufacturer for recommendations for suitable protective barriers to prevent future damage.

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- C. Inspect molded and formed equipment and components (e.g. circuit breaker cases, fuses, starters, relays, insulators, supports, etc.) for cracks or other defects.
- D. Check all bolts, connections, cable terminations, etc. for tightness using a calibrated torque wrench or screwdriver. Refer to manufacturer's instructions and markings for proper torque values.
- E. Visually check the equipment, its components and associated raceways, conductors, etc. for proper grounding and bonding. Ensure that grounding and bonding terminal bars, bus bars, straps, and conductors are properly connected.
- F. Verify that cables do not contact live parts and that cables are properly secured to withstand the effects of fault currents.
- G. Check equipment anchorage, mounting, clearances, alignment and fit of components.
- H. Check that phase barriers are in place, if applicable.
- I. Visually check disconnect switch blade alignment, blade penetration, travel stops, and mechanical operation.
- J. Inspect each fuse holder to determine whether it seems to be adequately supporting the fuse and that the fuse holders are securely attached to the mounting base. Verify fuses are set tightly in the clips provided.
- K. Operate equipment and components (e.g. disconnect switches, circuit breakers, etc.) to insure smooth operation.
- L. Motor bearings shall be checked for proper lubrication and the shaft turned to ensure it is free to rotate.
- M. Compare all circuits (internal and external) with wiring and/or control diagrams to verify they are installed correctly.
- N. Confirm correct operation and sequencing of electrical and mechanical interlock systems, if so equipped. Attempt closure on locked-open devices. Attempt to open locked-closed devices.
- O. Confirm that equipment nameplates and safety labels are provided.

3.18. TESTING

- A. The Contractor shall perform all tests required in the various sections of the specifications and in accordance with manufacturer's recommendations. Record test results and include in operation and maintenance manuals.
- B. The Contractor shall coordinate with and assist with the testing, calibration, systems coordination, etc. with the Owner for integration of the control panels, their components and other control and instrumentation devices as required into the Owner's system.

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- C. The Owner and Engineer shall be notified one week prior to any testing so that the testing may be witnessed.
- D. All testing shall be performed by personnel that are trained in the specific task to be performed. Assistance by manufacturer's representative with testing shall be provided if requested by the Owner and/or Engineer without increase in contract sum.
- E. Do not proceed with tests until previously identified deficiencies are corrected.
- F. Test equipment in accordance with manufacturer's recommendations. Maintain test results for future comparisons. Include in operation and maintenance manuals.
- G. Upon completion, all equipment and systems shall be tested for functional operation, including all intended modes and sequences of operation.
- H. Readings of the voltage and amperage shall be taken on each phase at each panelboard and at the end of the longest branch circuit at no load and full load conditions.
- I. All systems shall test free from shorts and grounds and shall be without mechanical and electrical defects. If any test indicates a failure, in the opinion of the Engineer; the item shall be replaced or suitably repaired to the approval of the Owner and Engineer, and the test repeated without additional cost to the Owner.
- J. The Owner's and/or Engineer's decisions shall be final regarding the acceptability and completeness of the installation and associated testing.

3.19. START-UP AND ENERGIZING

- A. The Contractor shall start up and test all equipment and systems for functional operation, including all intended modes and sequences of operation; except the Contractor shall assist Owner as required in the start-up and energization of process control and instrumentation systems furnished by the Owner.
- B. Start-up and energize equipment in accordance with manufacturer's recommendations.
- C. The Owner, Engineer and other affected personal shall be notified one week prior to energizing so that the energizing may be witnessed.
- D. Energize equipment, feeders, circuits, etc. from the source end and working to the load. Close main devices, feeder devices, motor/branch circuit devices, etc. in sequence.
- E. Verify all temporary grounding, etc. connections are removed prior to energizing.
- F. Verify that all load disconnecting, etc. devices are open, padlocked and tagged prior to energizing.
- G. Motors:

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1. Motors shall be started uncoupled to verify proper rotation. Reverse if required.
 2. With correct rotation, motors shall be run uncoupled for minimum 30 minutes. While running, motors shall be observed for unusual conditions such as vibration, noise, excessive winding or bearing temperature rise, etc.
- H. After energization, equipment shall be observed for unusual conditions such as vibration, noise, excessive temperature rise, etc.
- I. Readings of the voltage and amperage shall be taken on each phase at each panelboard and at the end of the longest branch circuit at no load and full load conditions.

3.09. CONTRACT CLOSE-OUT

- A. As a requirement for substantial completion of the Work, the Contractor shall thoroughly check the installation. Checking shall consist of visual inspection and manual adjustment to confirm correct installation and arrangement and to assure the intended function, response and operability. Checking shall include, as a minimum, the following:
1. Check that equipment, devices, etc. are of the correct type and rating.
 2. Check that all raceways, fittings, devices, boxes, enclosures, etc. are secure and that all conduit connections are tight.
 3. Check that all electrical connections are correctly tightened.
 4. Check that equipment, devices, panelboard circuit directories, etc. are correctly labeled.
 5. Check that equipment, fixtures, devices, etc. are clean with all unnecessary labels removed.
- B. As a requirement for substantial completion of the Work, the Contractor shall:
1. Obtain final inspections from the authorities having jurisdiction.
 2. Perform final cleaning.
 3. Submit approved "As Built" Drawings, Record Documents, Test Records, Manuals, etc.
 4. Submit written warranty statements for equipment, materials and installation.
 5. Conduct system tests.
- C. After the requirements for substantial completion have been met, the contractor shall notify the Engineer in writing that the Work is substantially complete. The Engineer will then perform a final inspection of the installation and issue a "punchlist" for final completion.

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- D. The Contractor shall complete the work on the punchlist or provide written explanation for not completing the work. The punchlist shall be signed by the contractor and returned to the Engineer when complete.
- E. The Engineer will re-inspect the Work to verify that all the items have been completed.
- F. The above process shall be completed a single time for the project. If additional punchlist and inspection cycles are required to be completed due to the contractor's failure to complete items on the punchlist, the contractor will be backcharged for the Engineer's additional services on time and material basis through the construction contract.
- G. Subsequent to final completion and testing operations, instruct Owner's authorized representatives as required in operation, adjustment and maintenance of equipment and systems.

End of Section 26 00 10

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27, and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for the following:
 - 1. Low voltage cables.
 - 2. Hand holes.
 - 3. Warning Tape.
 - 4. Low voltage cables.

PART 2 - PRODUCTS

2.01. RACEWAYS

- A. Raceways, where required, shall be of the types listed below, unless noted otherwise:
 - 1. Electrical Metallic Tubing (EMT) - above grade, except as noted below.
 - 2. Polyvinyl Chloride Conduit (PVC) - below grade, except as noted below.
 - 3. Galvanized Rigid Steel Conduit (GRS) - Below grade conduit bends and risers.
 - 4. Galvanized Rigid Steel Conduit (GRS):

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- a. Below grade conduit bends and risers.
 - b. Above grade service entrance conduits.
 - c. Exterior exposed conduits, above grade.
 - d. Within, or passing through, Classified (Hazardous) locations.
5. Type MC Cable may not be used.
6. Flexible Metal Conduit (FLEX) - final connections to vibrating equipment and for fixture whips. Also, FLEX may be substituted for EMT for branch circuits between wiring devices and boxes concealed inside frame walls and ceilings. FLEX shall not be used for any homeruns, conduit stub-ups into accessible ceiling spaces, nor for any exposed or surface conduit runs except as final connections to vibrating equipment.
- B. Raceways shall be sized so that the cable fill does not exceed 40%; except, minimum conduit sizes shall be as follows:
 1. $\frac{3}{4}$ inch – above grade branch circuits, ancillary systems circuits or similar, except as noted below.
 2. 1 inch – branch circuit homeruns.
 3. 1 inch – below grade.
 4. 1 inch – telecommunications circuits terminating in a single outlet.
- C. PVC conduit shall be heavy-wall (Schedule 40), flame-retardant, suitable for use with 90°C cable, shall not distort from heat it will normally encounter and shall be resistant to low temperature and sunlight effects, impact and crushing.
- D. Galvanized rigid steel conduit (GRS) shall be hot-dipped galvanized with threaded couplings and connectors. Below grade steel conduits shall be coated with a suitable asphalt (or equivalent) compound for corrosion protection.
- E. Electrical metallic tubing shall be electro-galvanized steel.
- F. Flexible conduit shall be liquidtight type. Flexible conduit connections shall be a minimum of 18 inches long.
- G. Wireways shall be lay-in type with standard knockouts, screw covers for full channel access and the necessary complement of fittings, connectors, supports, etc. Wireways shall be of sufficient size to accommodate the required number of conduits and cables. Where indicated, or considered necessary, steel barriers shall be installed to separate circuits.

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- H. Conduit elbows and bends in conduits 2 inch diameter and smaller shall be not less than 6 times the conduit diameter and bends in larger conduits shall be not less than 10 times the conduit diameter.
- I. Telecommunications (with or without cables), spare, c.o., etc. conduits shall be provided with pull rope below grade and pull string above grade.
- J. Below grade telecommunications, spare, c.o., etc. conduits shall be plugged at both ends and their location properly marked.
- K. Yellow 3" wide polyethylene metalized warning tape shall be direct buried 12 inches above the topmost underground conduits. For multi-use excavations and trenches, provide multiple tapes.

2.02. RACEWAY FITTINGS

- A. Fittings for steel conduit shall be steel, galvanized or cadmium plated, threaded type. Couplings, locknuts and bushings shall be galvanized steel.
- B. Connectors, couplings, etc. for EMT shall be steel set-screw type; except, steel raintight compression type in potentially wet or damp locations (e.g. outdoors).
- C. Conduit bodies (i.e., type T, LB, LR, LL) shall be cast metal bodies with threaded connectors and screw covers. Increase size or bodies if required for fill and bending radius.
- D. Conduit bodies shall not be used in telecommunications system raceways.
- E. Fittings for flexible metal conduit shall be of a type specifically designed for the purpose.
- F. Fittings for nonmetallic conduits shall be of same manufacturer and material as the conduit.
- G. Conduit seals, in hazardous (classified) locations, shall be type EYS (Crouse-Hinds, Appleton, or approved equal) with sealing compound and fiber filler approved for the conditions and use, of the same manufacturer as the sealing fitting.
- H. Conduit terminations at equipment, etc. shall be suitably sealed and/or plugged at both ends to prevent the entrance of moisture. Spare, c.o., etc. conduits shall be provided with removable gasketed covers at the high end to prevent the flow of moisture from one box to another.
- I. End bells and/or insulated bushings shall be used on all underground conduit system terminations at vaults, junction boxes, padmounted equipment, etc.
- J. "Open" ends of spare conduits terminating in vaults and in telecommunications rooms shall be sealed with expandable plugs to prevent movement of air and water between spaces. Plugs shall be water and gas tight, with high-impact plastic components, elastic expandable gaskets and pull rope eyelet.
- K. "Open" end of telecommunications, spare, c.o., etc. conduits shall be provided with insulated bushings.

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- L. Connectors at sheet metal enclosures shall have insulated throats.
- M. Provide approved properly bonded expansion fittings (capable of expansion and contraction as required), deflection couplings, etc. in all below grade conduits over 10 feet in length and/or wherever conduits pass over or through joints or other locations where raceways may be affected by dissimilar movements of the supporting structure.

2.03. BOXES

- A. Boxes shall accommodate any devices to be installed and shall be sized as required by the applicable codes for number and size of conduits and cables entering and leaving; except minimum as noted below.
- B. Flush mounted indoor boxes above grade in dry locations shall be standard stamped galvanized steel type, suitable for embedment in concrete and/or masonry where required.
- C. Surface mounted boxes and boxes installed in wet or damp locations and outdoors shall be threaded rigid body type, cast aluminum or galvanized iron.
- D. Exterior outlet boxes shall be flush mount and contain surface metal weatherproof while-in-use covers, gaskets, mounting rings, and all necessary mounting accessories. Provide trim rings suitable for use with the type of siding or exterior building wall material. Boxes shall be Intermatic model WP1010MC or approved equal.
- E. Surface mounted boxes installed in wet or damp locations and outdoors shall be threaded rigid body type, cast aluminum or galvanized iron.
- F. Unless noted otherwise, larger size pull and junction boxes shall be fabricated from code gauge galvanized steel.
- G. Switch, outlet, device, junction, etc. boxes, in hazardous (classified) locations, shall be cast aluminum or galvanized iron, shall be sized as required by the NEC, with full access cover. Boxes shall be watertight and corrosion resistant, suitable for installation outdoors in a Class I, Division 1, Group D Classified (Hazardous) location. Appleton type GRSS or similar.
- H. Large junction boxes in hazardous (classified) locations, shall be cast aluminum, with hinged access cover, stainless steel captive quad-lead bolts and epoxy powder coat finish inside and out. Box shall be corrosion resistant, suitable for installation in Class I, Division 2, Classified (Hazardous) location.
- I. Switch, power outlet, device, etc. boxes shall be single or ganged to accommodate the required number of devices; except, flush mounted boxes shall be minimum 4 inches square for conduits 1 inches or less and $4^{11/16}$ inches square for larger conduits. Boxes containing a single device shall be minimum $1\frac{1}{2}$ inches deep. Boxes containing multiple devices shall be minimum $2\frac{1}{8}$ inches deep. Flush mounted boxes shall be equipped with plaster rings and suitable wallplates. Surface mounted boxes shall have raised surface type covers.

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- J. Junction and pull boxes shall be sized as required by the NEC except the minimum size shall be 4 inch, square or octagonal as required, by 1½ inches deep. Junction and pull boxes shall have full-access screw covers.
- K. Control, ancillary systems and similar outlet, device, junction, etc. boxes shall be in accordance with the requirements of the respective supplier; except, minimum as specified above.
- L. Boxes shall be equipped with mud rings where required and proper wallplates and/or covers.
- M. Openings in boxes, etc. through which cables are intended to pass shall be provided with suitable nonmetallic grommets.

2.04. HAND HOLES

- A. Hand holes shall be precast concrete, 22½" wide x 33" long x 12" deep, open bottom, in accordance with the Washington State Department of Transportation type J-11A, type 2. Covers shall be diamond plated galvanized steel, with lettering "Electric" according to wiring enclosed within.
- B. Mounting hardware (unless specifically noted otherwise), bolts, nuts, washers, etc. shall be stainless steel. All steel parts (except stainless steel) shall be hot-dipped galvanized after fabrication.

2.05. WIRE AND CABLE

- A. Wire and cable sizes indicated and/or specified are minimums only and shall be increased as required due to NEC, system, load, voltage drop, etc. requirements.
- B. All wire and cable (power, control, ancillary systems, etc.) installed in below grade conduit shall be suitable for wet locations.
- C. Ground electrode conductors shall be copper, bare below grade.
- D. Service and below grade feeder cable shall be single conductor stranded copper with 600 volt type XHHW insulation.
- E. Branch circuit cable, above grade feeder cable and equipment ground cable shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation. The minimum conductor size shall be #12 AWG; except, fixture whips provided as an assembly by the fixture manufacturer with the fixtures may be #14 AWG. Conductors shall be stranded, except #12 AWG lighting and general purpose receptacle branch circuit conductors may be solid.
- F. Line voltage (Class 1) control cable shall be single conductor stranded copper with 600 volt type XHHW or THWN/THHN insulation. The minimum conductor size shall be #14 AWG.
- G. Low voltage (Class 2) control cable shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation if installed in conduit. Low voltage (Class 2) control cable run "open" shall be multi-conductor copper with 300 volt insulation and an overall jacket, type CL2, listed as being resistant to the spread of fire; except in air handling plenums, cable shall be plenum rated, be

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listed as being resistant to the spread of fire and bear flammability testing ratings as cable type CL2P. The minimum conductor size shall be #16 AWG.

- H. Instrument cable, unless otherwise required by the particular instrument, shall be 2 conductor (twisted pair) solid copper with 300 volt PVC insulation, 100% aluminum polyester shield, stranded copper drain wire, and an overall PVC jacket. The minimum conductor size shall be #18 AWG.
- I. Cords shall be multi-conductor stranded copper with a green insulated grounding conductor, 600 volt type SO insulation and an overall neoprene jacket. Where installed in classified hazardous locations, the cable shall be extra hard usage type and rated for the appropriate classification. The minimum conductor size shall be #14 AWG.
- J. Fixture cable, where supplied by the Contractor, shall be stranded copper with 600 volt type PF insulation.
- K. Color coding for power cable shall be as follows:
 - 1. 480Y/277 volt, 3 phase, 4 wire:
Phase A = brown, B = orange, C = yellow, N = gray;
 - 2. 208Y/120 volt, 3 phase, 4 wire:
Phase A = black, B = red, C = blue, N = white;
 - 3. 120/240 volt, 1 phase, 3 wire:
Phase A = black, B = red, N = white;
 - 4. Equipment ground cables shall be green.
 - 5. Switch legs shall be the same color as the phase conductors. Switch travelers shall be purple.
- L. Cable pulling lubricants shall be gel type, of the best quality and shall not have any damaging effect on the insulation. (Ideal Yellow 77 is not approved.)

2.06. CABLE SUPPORTS

- A. Cable ties shall be utilized in panelboards, etc. to group and support conductors. All cable shall be fanned-out to terminals and identified by labels; or, if terminated on circuit breakers or control devices, by typewritten indexes or nameplates.

2.07. CABLE CONNECTIONS AND TERMINATIONS

- A. Taps and splices shall be kept to a minimum.
- B. Taps and splices in #8 AWG, and smaller, branch circuit cable shall be made with twist-on spring type wire nuts. Taps and splices in telecommunications cables, ancillary systems cables, larger branch circuit cables, feeder cables, control cables, etc. or below grade will not be allowed without specific approval from the Engineer.

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- C. Taps and splices in handholes shall be made with proper size squeeze-type copper compression tap and splice connectors. (Mechanical set-screw type connectors will not be allowed.) All splices and taps in handholes shall be watertight, suitable for direct burial use, with an abrasion, UV and impact resistant cover pre-filled with chemically cross-linked silicone elastomer and silicon oil gel sealant. The gel and its cover shall completely encapsulate the splice and/or tap area. Tyco Electronics GelWrap or equal.

2.08. WARNING TAPE

- A. Yellow 3" wide polyethylene metalized warning tape shall be direct buried 12 inches above the topmost underground conduits. For multi-use excavations and trenches, provide multiple tapes.
- B. Tape shall be printed with the words:
 - 1. "Caution, Buried Power Line Below" or similar above electrical conduits.
 - 2. "Caution, Buried Lighting Line Below" or similar above lighting conduits.
 - 3. "Caution, Buried Data Line Below" or similar above telecommunications conduits.

2.09. PULL STRING AND ROPE

- A. Pull string shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.
- B. Pull rope shall be twisted polypropylene treated with ultraviolet stabilizers, minimum $\frac{1}{4}$ inch diameter. Rope shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.

PART 3 - EXECUTION

3.01. RACEWAYS

- A. Raceways shall be installed straight, plumb and true and shall be without kinks or sags. Exposed raceway runs shall be either parallel or at right angles to walls and structural members, as neatly and unobtrusively as possible (e.g. adjacent to window and door trims and base, at wall/wall or wall/ceiling intersections, etc.).
- B. Below grade conduits shall be direct buried between 24 and 30 inches below grade (except, conduits below the building concrete floor slab may be run immediately below the floor) and/or as required to bury conduits below footings, grade beams, etc., and spaced a minimum of 2 inches between conduits. Underground conduits shall be suitably sealed or plugged at both ends and PVC conduit solvent welded to prevent the entrance of moisture.

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- C. Raceways shall be located to not interfere with the removal of pipes or equipment for maintenance or repair. All raceways shall be kept a minimum of 6 inches away from items producing heat.
- D. Above grade raceways, fittings, etc. shall be securely supported from permanent structural members of building, either directly or indirectly. Raceways shall be fastened at intervals of 8 feet, nominally, and within 36 inches of each outlet, fitting, panel, etc. Single runs of exposed conduit shall be supported with steel pipe straps. Conduit shall not be supported from piping or from other conduits but only from building structural elements.
- E. Bends in raceways shall be made without flattening, kinking or reducing the cross-sectional area of the raceway.
- F. All raceway cuts shall be made square with a proper cutting tool. The inside and outside of all raceway ends shall be reamed after cutting and/or threading to eliminate burrs and rough edges, then wiped clean. Joints shall be cut square and shall butt solidly into couplings. Running threads will not be permitted.
- G. Raceways shall be closely and tightly fitted in couplings, connectors, boxes, etc. to provide an electrically continuous low resistance ground fault return path. Threaded joints shall be made up with at least 5 threads fully engaged.
- H. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before pulling any cable.
- I. Metalized warning tape shall be direct buried 12 inches above the topmost underground conduits. For multi-use excavations and trenches, provide multiple tapes.

3.02. EXCAVATION AND BACKFILLING

- A. Excavate to depths noted, and as required for proper completion of all below grade work and cut to sufficient size to provide ample room for construction of forms, shoring and bulkheads as required.
- B. Underground utilities (electrical, water, sewer, cable television, etc.) are known to exist in the area of construction. The location of existing utilities shown on the drawings is approximate only and is not guaranteed to be an indication of all utilities in the area. The contractor is responsible for contacting the Owner and all utility companies and for field location of all utilities prior to construction. The one-call number for underground utility location services is 811 (1-800-424-5555). The Contractor shall promptly notify the Engineer of any conflicts between the contract documents and field location of existing utilities. The Contractor is responsible for maintaining the integrity of all existing utilities during construction and shall be responsible for repairing and/or replacing (as required) all that he damages, known or unknown, located or not located.
- C. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.

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- D. Provide a spotter at all times when excavation occurs by use of a backhoe, excavator or other mechanical equipment.
- E. Shore and brace excavations where necessary to prevent cave-ins and in accordance with all safety laws and codes.
- F. During excavations and backfilling, extreme care shall be taken to keep rocks and other rough material away from conduits and cables. Pack a minimum of 6 inches of soft fill material (free from stones, rocks and other rough material that might be forced against the conduits and cables during backfilling, or when settling or frost-heaving disturbs the surrounding earth) around conduits and cables. Wash in to avoid air gaps.
- G. Backfill shall be good compactable material without large rocks, chunks or sticks. Backfill in all excavations shall be progressively compacted in maximum 12 inch lifts to 95% of maximum density, and shall be without voids.
- H. Prior to excavation, the Contractor shall mark or otherwise show the location of all equipment and vaults, and obtain specific approval from the Owner and Engineer for the location of each prior to installing equipment, boxes, raceways, etc.
- I. Maintain all bench marks, control monuments and stakes, whether newly established by Surveyor or previously existing. Protect from damage and dislocation. If necessary to disturb existing benchmark, re-establish in a safe place.
- J. The clearance between the underground conduit systems and other underground items, such as water and sewer lines shall be as large as necessary to permit maintenance of any of the systems without damage to the other items.
- K. Keep all excavations, pits, trenches, etc., entirely free from water. Protect excavations from rain or water from any source during construction. Use suitable pumping equipment or other means as required by conditions. Continue pumping as necessary until completion of work.
- L. When operations are interrupted by unfavorable weather conditions, prepare areas by grading and compaction to avoid ponding and erosion.
- M. Dirt shall not be permitted to accumulate on roads or adjacent green belts, nor to be washed into drainage ditches.
- N. Appropriate steps, such as the application of water, shall be taken to prevent airborne dust due to the work, particularly during excavation and moving of materials.
- O. Trenches, excavations and any damage to adjoining areas shall be repaired/restored to existing or better condition to the approval of the Owner and Engineer.

3.03. WARNING TAPES

- A. Direct bury warning tape 12 inches above topmost conduits. For multi-use excavations and trenches, provide multiple tapes. Tapes shall extend into vaults and be stubbed up with and secured to conduits as required for access when tracing or locating.

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3.04. LABELING & IDENTIFICATION

- A. Junction boxes concealed in ceiling spaces and exposed in electrical, mechanical, utility rooms, and the like shall be marked with the panel and circuit numbers contained within. Marking shall be legibly hand-written with black indelible ink marker.
- B. In each junction and pull box, neutral conductors shall be grouped with associated phase conductors by taping the conductors together.
- C. Interior spare, C.O., etc. conduits shall be labeled with their destination. Labeling shall be made by neatly hand writing on the conduits or enclosures with indelible marker.
- D. Exterior below grade conduits entering electrical rooms, communications rooms, enclosures, vaults, etc. shall be labeled with their destination. Labeling shall be made by neatly hand writing on the conduits or enclosures with indelible marker.
- E. Color coding for power cable shall be as follows:
 - 1. 480Y/277 volt, 3 phase, 4 wire:
Phase A = brown, B = orange, C = yellow, N = gray;
 - 2. 208Y/120 volt, 3 phase, 4 wire:
Phase A = black, B = red, C = blue, N = white;
 - 3. 120/240 volt, 1 phase, 3 wire:
Phase A = black, B = red, N = white;
 - 4. Equipment ground cables shall be green.
 - 5. Switch legs shall be the same color as the phase conductors. Switch travelers shall be purple.

3.05. BOXES

- A. Boxes shall be installed plumb and true and be firmly supported either directly or indirectly by a sound and safe structural member of the building with approved anchors and fasteners, and shall be readily accessible for maintenance.
- B. Pull boxes or fittings shall be provided in conduit runs as required to prevent excessive stress on the cables during pulling and to allow the minimum required bending radius.

3.06. WIRE AND CABLE

- A. All wire and cable shall be enclosed within the raceway system.

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- B. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label, that it is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.
- C. Conductors of different voltages, systems, functions, etc. shall not be combined in the same raceway or cable unless specifically noted otherwise.
- D. Wire and cable shall not be exposed to weather or mechanical damage longer than necessary. Cut ends of cable shall immediately be sealed.
- E. Cable shall be unrolled from reels, or removed from cartons, and installed in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation. Use only guides, rollers, sheaves, etc. that are free-turning and clean. Cable shall not be dragged on the ground or over sharp edges or abrasive surfaces. Slack wire shall be provided at all pull points.
- F. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway system shall be complete, snaked and cleaned before pulling any cable.
- G. All cables shall terminate in an approved enclosure or fitting.
- H. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- I. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

- J. Conductor connections shall be made with connectors of the proper size and type. Compression connections shall be made with the correct die and number of crimps, or the correct tightening torque in the case of mechanical connectors, according to manufacturer's instructions and recommendations. Use suitable oxide inhibiting joint compound on all aluminum terminations. Care shall be taken to not nick conductors during insulation removal.
- K. At pulling points, the cables shall be neatly bundled by circuit.
- L. Taps and splices shall be kept to a minimum; and are not allowed in cables larger than #8 AWG, control cable, ancillary systems cable, etc. and below grade without prior approval from the Engineer.
- M. Conductor connections shall be made with connectors of the proper size and type. Compression connections shall be made with the correct die and number of crimps, or the correct tightening torque in the case of mechanical connectors, according to manufacturer's instructions and recommendations. Use suitable oxide inhibiting joint compound on all aluminum terminations. Termination of insulated conductors shall be made so that the stripped length of bare conductor is

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not longer than required for the terminal or connector. Care shall be taken to not nick conductors during insulation removal.

- N. At pulling points, the cables shall be neatly bundled by circuit.
- O. Field wiring shall not contact live parts.
- P. Cables shall not be supported by their terminations. Suitable cable ties and/or supports shall be utilized in switchboards, panelboards, terminal boxes, junction boxes, vaults, etc. to group and support conductors. All cable shall be fanned-out to terminals and identified by labels; or, if terminated on circuit breakers or control devices, by typewritten indexes or nameplates.
- Q. Insulated cable supports shall be provided to relieve any strain imposed by cable weight or movement, and to secure cable as required to withstand the effects of fault currents.

3.07. CABLE TESTING

- A. Service and feeder cables, including panels with branch circuit breakers open, shall have the insulation resistance to ground measured with other phases grounded after all splices and terminations are made; except, before connection to utilization equipment, fixtures, etc. Test cables phase to phase and phase to ground, with the other phase(s) grounded. Insulation resistance shall be measured using a 500 volt megger, Measure insulation resistance at one minute following the application of the test voltage. The minimum reading shall be 1.0 megohms. Ground each phase at the completion of the test.
- B. Control and branch circuits do not require an insulation test, functional tests only are required; except, all receptacles shall be tested for correct connection using a suitable receptacle tester.

3.08. PENETRATIONS

- A. Wall, ceiling and floor penetrations by raceways (both inside and outside the raceway), cables, etc. shall be sealed to maintain the original moisture, dust and fire resistance to the approval of the Engineer.
- B. Do not cut, notch or drill structural framing members for the installation of raceways without the Engineer's approval in each case. Holes and penetrations where allowed in studs, joists and other structural members for raceways and cables shall be of a size to allow for a tight fit.
- C. Flash and counter-flash all roof penetrations.

3.09. PULL STRINGS AND ROPES

- A. Provide pull ropes in all below grade telecommunications (with and without cables), spare, etc. conduits.
- B. Provide pull strings in all above grade telecommunications (with and without cables), spare, etc. conduits.

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3.10. CONTROL SYSTEM

- A. The Contractor shall coordinate with control systems suppliers and provide conduit, boxes, cables, etc. in accordance with their requirements; except, minimum as indicated and/or specified.

End of Section 26 05 00

SECTION 26 05 26 – GROUNDING

PART1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the grounding work.
- B. Coordinate grounding work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

PART 2 - PRODUCTS

2.01. GROUNDING

- A. Ground rods shall be copper clad steel, $\frac{5}{8}$ inch diameter by 10 feet long minimum.
- B. Ground clamps, nuts, washers, etc. shall be corrosion resistant high copper alloy or silicon bronze; except, below grade and foundation rebar ground connections shall be exothermic welded (Cadweld or approved equal) or copper compression type.
- C. Ground clamps, nuts, washers, etc. shall be corrosion resistant high copper alloy or silicon bronze; except, below grade ground connections and connections within the Sewer Pump Station wet and dry wells shall be exothermic welded (Cadweld or approved equal) or copper compression type.
- D. Feeder circuits, branch circuits, control circuits, etc. shall include a separate equipment ground cable (sized the same as the largest circuit conductor, unless otherwise noted) run in the same raceway with the circuit conductors. Equipment ground conductors for feeder circuits, branch circuits, control circuits, etc. installed in metallic raceways shall be redundant, consisting of both an electrically continuous metal raceway system and the separate equipment ground cable run in the same raceway with the circuit conductors.

SECTION 26 05 26 – GROUNDING

2.02. PANELS

- A. Provide both ground and neutral bars in panels, motor control centers, etc.. All connectors and lugs shall be solderless, pressure type suitable for copper or aluminum wire.

2.03. WIRE AND CABLE

- A. Ground wire and cable sizes indicated and/or specified are minimums only and shall be increased as required due to National Electrical Code, system, load, voltage drop, etc. requirements.
- B. Ground electrode conductors shall be copper, bare below grade.
- C. Equipment ground cable shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation. Conductor size shall match feeder, branch circuit, etc. conductor size unless noted otherwise. Conductors shall be stranded, except #12 AWG lighting and general purpose receptacle branch circuit conductors may be solid.

PART 3 - EXECUTION

3.01. GROUNDING

- A. All electrical equipment, enclosures, boxes, devices, etc. shall be provided with a ground fault return path both by means of an insulated grounding conductor installed with the circuit conductors and the integrity of the raceway system. Bond raceway system as required.
- B. Ground terminals of all equipment, devices, etc. shall be grounded by the equipment ground conductor.
- C. Raceways shall be closely and tightly fitted in couplings, connectors, boxes, etc. to provide an electrically continuous low resistance ground fault return path. Threaded joints shall be made up with at least 5 threads fully engaged.
- D. Building steel and interior metal piping systems shall be suitably bonded.
- E. Service shall be grounded to the concrete encased grounding electrode (foundation rebar). Contractor shall verify that the foundation concrete is in direct contact with earth and is not insulated from contact by a vapor barrier or by moisture sealant paint. Where the concrete reinforcing bars are not suitable for use as a grounding electrode, Contractor shall provide minimum 20 feet of # 4 AWG ground cable encased in the concrete.
- F. Service shall be grounded to the driven ground rods.
- G. Exothermic welded connections shall be done strictly in accordance with manufacturer's instructions, and then enclosed in an air-tight sealing compound to prevent moisture intrusion and minimize corrosion. Molds shall not be altered. All connection materials shall be of the same manufacturer.

SECTION 26 05 26 – GROUNDING

- H. Connections shall be both mechanically and electrically secure. Torque connecting hardware in accordance with the manufacturer's instructions and recommendations.
- I. Torque connecting bolts at telecommunications grounding busbars to 35 ft/lbs.
- J. Compression connections shall be made with the correct die and number of crimps, or the correct tightening torque in the case of mechanical connectors, according to manufacturer's instructions and recommendations.
- K. Grounding conductors exposed to mechanical damage shall be protected with PVC conduit sleeves with bushings.
- L. Before grounding connections are made, contact surfaces shall be thoroughly cleaned. Connections shall be both mechanically and electrically secure.
- M. Tests shall be made to verify the continuity of the ground system and all ground fault return paths.
- N. After completion of the grounding system, the resistance of the grounding network to earth shall be measured using a ground megger using a fall of potential test method. Driven ground rods shall be disconnected and tested separately from the grounding system. The minimum ground earth resistance shall be maximum 25 ohms.

End of Section 26 05 26

SECTION 26 07 00 – THERMAL & MOISTURE PROTECTION

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27, and 28 Sections apply to all the thermal & moisture protection work.
- B. Coordinate thermal & moisture protection work with related work shown and specified elsewhere.
- C. Repair of existing roofing and flashing altered by work of demolition and construction, including restoration of base, insulation, membranes, flashing, adhesives, sealants, and roofing accessories integrally related to roof installations.
- D. Perform investigation and analysis of roof membrane and insulation to determine composition of existing systems prior to beginning of the work of this section. Match existing materials and assemblies in repair of roofing and flashing.
- E. Provide all materials necessary for the proper execution and completion of the Work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- F. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

PART 2 - PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system.

2.02. MOISTURE PROOFING

- A. Moisture proofing systems shall be designed and installed to allow the passage of cable, conduit or pipe through exterior walls, etc. and vaults. They shall provide a barrier seal to prevent the penetration of water and gases into the structure to be penetrated.
- B. Provide roofing materials recognized to be specifically for use with the type of roofing surface penetrated. Products shall be tested to show compliance with indicated performances, or provide

SECTION 26 07 00 – THERMAL & MOISTURE PROTECTION

other similar materials certified in writing by manufacturer to be equal or better than specified in every respect.

2.03. FIRE STOPPING AND SEALING MATERIALS

- A. Fire-stop systems shall be designed and installed to allow the passage of cable, conduit or pipe through fire rated walls or floors. They shall provide a barrier seal to prevent the penetration of fire, smoke, water, and gases, with a fire rating to match the rating of the architectural assembly or structure to be penetrated.
- B. Fire-stop systems shall be resistant to direct hose spray.
- C. Fire-stop systems shall consist of one or more of the following materials:
 - 1. Ablative (typical of silicone-based technology).
 - 2. Cementitious (Can be troweled like grout or mortar, but is specifically rated for the purpose. Grout shall not be permitted).
 - 3. Elastomeric (Flexible substance which resembles rubber).
 - 4. Endothermic (Absorbing heat energy.).
 - 5. Intumescent (Swelling under the influence of heat, pillows, etc.).
 - 6. Mechanical (Assemblies that allow additions or deletions).
- D. Fire-stop systems shall be UL classified for the intended use.
- E. Wall, ceiling and floor sleeves and the like shall be metallic raceways with intumescent bags or bricks; except, at the option of the Contractor, sleeves may be metallic wireways (sized to match the required raceways) which contain an intumescent insert material that adjusts automatically to cable additions or subtractions, Specified Technologies EZ Path, 3M Fire Barrier Pass-Through, or approved equal.
- F. Fire-stop material around cable penetrations, within raceways (except wall and floor sleeves), etc. shall be intumescent bags, bricks, or soft, pliable, non-hardening intumescent putty, with high dielectric strength (insulator). Material shall allow removal of the material(s)/system(s) for future cable additions and/or removals.
- G. Drywall joint compound, concrete, and mineral wool shall not be used as fire stopping materials.
- H. Fire-stop products shall be as manufactured by 3M, Dow Corning, Hilti, Nelson, Specified Technologies, Unique Fire Stop Products, or approved equal.

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2.04. DUST SEALING MATERIALS

- A. Dust seal systems shall be designed and installed to allow the passage of cable, conduit or pipe through non-rated ceilings, walls, partitions or floors.
- B. Dust sealant around raceways and the like shall be top grade paintable silicone based or poly-sulfite caulk, or expanding foam type sealant.
- C. Dust sealant around cable penetrations, within raceways, etc. shall allow removal of the material for future cable additions and/or removals.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. Provide all fire-stop sealing for all penetrations through fire-resistance-rated floors, walls and partition construction; including empty openings and openings containing cables, raceways, cable trays, cable racks, sleeves, supports and other penetrating items as required, both new and existing where new cables, raceways and the like have been installed. Contractor is responsible for verifying the fire rating of the barrier to be penetrated.
 - 1. Install fire-stop systems in accordance with manufacturer-tested methods and to manufacturer's instructions. If required, extend fire-stop system through the full thickness of the wall or floor and through the full length of the sleeve.
 - 2. Seal openings with a removable fire-stop material after each shift. Do not leave unattended openings in building fire-resistance-rated walls, partitions and floors at any time during construction.
- B. Where sleeves or penetrations are installed through non-rated partitions, provide a dust seal to prevent dust from migrating between the spaces separated by the partition. Also, where fire stop material does not completely fill an opening (e.g. intumescent pillows), provide suitable dust sealant as required.

3.02. MOISTURE PROOFING

- A. Conduit terminations at equipment, etc. shall be suitably sealed and/or plugged at both ends to prevent the entrance of moisture.
- B. Underground conduits extending into buildings and at transformers, switchgear, etc. shall be suitably sealed or plugged at both ends. Underground conduits between vaults shall be suitably sealed or plugged at the high end. Sealant shall be removable. Ductseal is not acceptable.
- C. Conduit penetrations through retaining walls and building exterior walls shall be suitably sealed and/or grouted to prevent the entrance of moisture.

SECTION 26 07 00 – THERMAL & MOISTURE PROTECTION

- D. PVC conduit shall be solvent welded to prevent the entrance of moisture.
- E. Comply with manufacturer's installation instructions and recommendations particular to each product for all roof penetrations. Repair existing roofing and flashing altered by work, including restoration of base, insulation, membranes, flashing, adhesives, sealants, and roofing Accessories integrally related to roof installations. Clean all effected surfaces prior to roofing work. Flash and counter-flash all roof penetrations.

End of Section 26 07 00

SECTION 26 20 00 – ELECTRICAL TRANSMISSION & DEVICES

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27, and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for the following:
 - 1. Meter Base.
 - 2. CT Enclosures.
 - 3. Motor Control Centers.
 - 4. Panelboards.
 - 5. Circuit breakers.
 - 6. Disconnects.
 - 7. Transformers.
 - 8. Wiring devices & wall plates.

PART 2 - PRODUCTS

2.01. ELECTRIC POWER SERVICE

- A. Utility meter base shall be surface mounted, NEMA 3R, in accordance with the requirements of Puget Sound Energy Co. for the service size and type indicated.
- B. Current transformer enclosure shall be surface mounted, NEMA 3R, in accordance with the requirements of Puget Sound Energy Co. for the service size and type indicated.

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2.02. MOTOR CONTROL CENTER

- A. Motor control centers shall be furnished by the Process Control and Instrumentation Systems (PCIS) Contractor, installed by the electrical contractor.
- B. Motor control centers shall be dead front, industrial drawout type with combination starters, variable frequency drives, etc. as indicated, of the manufacturer's latest standard design, and expandable in either direction.
- C. Vertical sections shall be approximately 90 inches high x 20 inches wide x 15 or 20 inches deep (as required), joined together to form a rigid free-standing totally enclosed assembly, front access only, fabricated from code gauge (or heavier) galvanized steel. Access to wiring space, terminal blocks and connections shall be from the front only. Each structure shall be provided with 2 horizontal wiring troughs of approximately the same size (1 at the top and 1 at the bottom), and each section shall have a vertical wiring trough with separate hinged door for access to unit wiring. Each section shall be equipped with full metal sides. Top shall have a removable plate. Bottom shall be open. The systems shall be designed to allow the future addition of future sections and to permit the interchanging of units. Enclosure shall be suitable for either top or bottom cable entry. Finish shall be manufacturer's standard.
- D. Access to each compartment shall be by hinged doors. Unit compartments shall be separated by removable isolating barriers. Spaces shall be fully equipped with bus, rails, removable blank cover plates, etc. as required for future insertion of a unit.
- E. Motor control centers shall be ventilated as required to minimize heat build-up on drives, starters, etc. Provide fans and/or ventilation openings as required. All ventilating openings shall be provided with corrosion-resistant insect-proof screens on the inside.
- F. Bus system shall be either copper or aluminum, horizontal and vertical, supported braced and isolated from units and wiring troughs by a suitable molded, high strength, non-tracking, non-metallic insulating material.
- G. A full-length bare copper ground bar, located in the bottom wireway compartment, shall be provided. Each vertical section shall have a vertical ground bus that is connected to the horizontal ground bar. This vertical ground bus shall be installed so that the units engage the ground bus prior to engagement to the power bus and shall disengage only after the power bus is disconnected upon removal of the unit.
- H. Individual units shall be standardized, removable and interchangeable, arranged as indicated; except, where manufacturer's standard design does not fit the space allowed, adjustments will be allowed. Line connections to the bus shall be plug-in type, designed to disconnect the unit automatically when it is removed from the motor control center. Each circuit breaker, etc. shall be operable from the front and padlockable with the compartment door closed.
- I. Units shall be wired per NEMA 1, Class B standards with pull apart type clamp or screw type terminal blocks.
- J. Main lugs shall be monitored by a built-in Power and Demand Meter.

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1. Meter(s) shall be combination digital type, minimum 600 volt AC rated, with alpha/numeric liquid crystal front panel displays providing volts (A-N, B-N, C-N, A-B, A-C & B-C), amps (A, B & C), kilowatts, kilovars, power factor, kilowatt demand and kilowatt-hour readings. Readings shall be selectable with faceplate controls.
 2. Meter(s) shall be provided with an Ethernet TCP/IP data output for future remote monitoring.
 3. Current transformers and fused voltage connections shall be provided as required. Current transformers shall be donut type, minimum $\pm 2\%$ accuracy, 600 volt insulated. Current transformer ratios shall match feeder circuit breaker rating.
 4. Meter(s) shall be identified with laminated plastic nameplates, black face, white core, engraved with minimum $\frac{1}{8}$ inch letters, clearly and accurately identifying the function and location.
- K. Motor control centers shall be provided with laminated plastic nameplates to identify the system color coding scheme for phase and neutral conductors as required.
- L. Motor control centers shall be provided with warning nameplates to warn personnel of potential arc flash and shock hazards in compliance with the NFPA 70E standard. Nameplates shall include the voltage system, arc flash boundary limits and PPE category specific to the location.
- M. Motor control centers shall be manufactured by Allen-Bradley, to match and integrate with existing City of Ferndale systems and equipment.

2.03. MOTOR STARTERS

- A. Motor starters shall be mounted inside the motor control centers, as indicated.
- B. Motor starting switches shall consist of a manually operated toggle type switch (or Hand-Off-Auto switch where indicated) with thermal overload relay, heaters and pilot light. Switch mechanism shall be quick make-quick break type with an operating handle whose position is easily recognizable and lockable in the OFF position. Heaters shall be sized for the actual motor full load amps.
- C. Magnetic motor starters shall be of the full voltage type, NEMA standard (IEC standard will not be allowed), 600 volt, 3 pole with manual reset thermal overload relays and heaters, fused and grounded control power transformer, 110 volt holding coil (or 24 volt for heating and ventilating equipment units, if directed by the mechanical control contractor), "Run" pilot light, either "Start-Stop" pushbuttons or "Hand-Off-Auto" selector switch (as directed), and additional accessories as required. Motor starter contactors shall be of the gravity dropout type with double-break contacts. The contacts and coil shall be replaceable without removing the starter from its enclosure. Heaters shall be sized for the actual motor full load amps.
- D. Motor starter relays shall be minimum 300 volt rated, industrial type, electrically operated, NEMA standard, horsepower rated, with 110 volt holding coil (or 24 volt for heating and ventilating

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equipment units, if directed by the mechanical control contractor) and the number of contacts required.

- E. Terminal blocks, clamp or screw type, shall be provided for all external wires entering starters, etc. where suitable terminals are not available on the devices. Control wires shall not be spliced or tapped using wire nuts without approval from the Engineer.
- F. Starters, panels, etc. shall be identified with laminated plastic nameplates, black face, white core, engraved with minimum $\frac{1}{4}$ inch letters describing its function.

2.04. VARIABLE FREQUENCY DRIVES

- A. Variable frequency drives shall be mounted inside the motor control centers, as indicated.
- B. Variable frequency drives shall be as specified in Section Process Control & Instrumentation 27 00 00.

2.05. PANELS

- A. Panels shall be mounted inside the motor control centers, as indicated.
- B. Panel shall be dead-front, circuit breaker type panelboard, suitable for use as service entrance equipment where required. Branch circuits shall be arranged using double row construction. Interiors shall be rigid and so designed that circuit breakers can be replaced, changed or added without disturbing adjacent units and without machining, drilling, or tapping.
- C. Busses shall be copper or tinned aluminum. Ground and neutral bars shall be provided. All connectors and lugs shall be solderless, pressure type suitable for copper or aluminum wire.
- D. Panels shall all be of the same manufacturer, no substitutions.
- E. Circuit breakers shall be bolt-on, molded-case, thermal magnetic, quick make-quick break type with trip indicating handles. Branch circuit breakers for motor loads shall be HACR type. Branch circuit breakers for lighting loads shall be SWD type. Multi-pole breakers shall be single-handle, common trip. Tandem breakers shall not be used. Main and/or feeder and branch circuit breakers shall be series short circuit rated. Provide padlocking devices on circuit breakers where required.
- F. Circuit breakers for installation in the existing panelboard(s) shall be of the same manufacturer, and be of a type manufactured specifically for that type, vintage and short circuit rating of the panelboard.
- G. Provide approved handle ties between single pole circuit breakers for all multiwire branch circuits as required.
- H. Panels and circuit breakers shall be fully short circuit rated. Series rating of circuit breakers will not be allowed.

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- I. Spaces shall be bussed for the maximum device that can be fitted into them, and shall be equipped with mounting and connecting accessories for future installation of circuit breakers.
- J. Panels shall be suitable for top and bottom entry of feeder and branch circuit conduits, cables, etc.
- K. Panels shall be industrial/commercial type panelboards with hinged door, catch and lock (all keyed alike). Residential type loadcenters will not be allowed.
- L. Panels and each feeder breaker in each (clearly and accurately identifying the function and location) shall have laminated plastic master nameplates. The panelboard nameplate shall include the name of the panel and the name and location of the equipment from which the power originates.
- M. Panels shall be provided with laminated plastic nameplates to identify the system color coding scheme for phase and neutral conductors as required.
- N. Panels shall be provided with warning nameplates to warn personnel of potential arc flash and shock hazards in compliance with the NFPA 70E standard. Nameplates shall include the voltage system, arc flash boundary limits and PPE category specific to the location.
- O. Panels shall have a circuit directory frame and card with a transparent cover furnished on the door. Directory cards shall have a typewritten index clearly and accurately identifying the function and location (using the room name and numbering system shown on the Architectural plans) of the circuit. Provide new typewritten circuit directory cards for all existing panels that are modified in any way.
- P. Circuit directory cards shall be arranged to match the physical arrangement of the breakers, with odd numbered circuits on the left side of the card and even numbered circuits on the right side of the card. Where required due to the size of the directory frame, the odd numbered circuits may be on a separate card from the even numbered circuits. Odd and even numbered circuits shall not be intermingled together.

2.06. DISCONNECT SWITCHES

- A. Disconnect switches shall be heavy-duty, horsepower rated, safety switches, suitable for use as service entrance equipment where required. The switches shall have a handle whose position is easily recognizable, lockable in the OFF position, operable from the front and in control of the disconnecting means with the cover open or closed. The switch position shall be non-teasible, positive, quick make-quick break. Line, load, neutral and ground lugs shall be provided as required. Cable terminals shall be suitable for copper and aluminum wire.
- B. Disconnect switches shall be identified with laminated nameplates, black face, white core, engraved with minimum $\frac{1}{4}$ inch letters describing its function. The disconnect nameplate shall include the name of the disconnect and the name and location of the equipment from which the power originates.
- C. Disconnect switches shall be provided with warning nameplates to warn personnel of potential arc flash and shock hazards in compliance with the NFPA 70E standard. Nameplates shall include the voltage system, arc flash boundary limits and PPE category specific to the location.

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2.07. POWER TRANSFORMERS

- A. Transformers shall be mounted inside the motor control centers, as indicated.
- B. Transformers shall be ventilated dry type with steel enclosure, floor mounted on sound absorbing/vibration isolating pads. Transformers shall meet the latest NEMA and DOE energy efficiency standards.
- C. Transformers shall be designed to have low no load (core) losses, meet the requirements of the Class I Efficiency Levels for distribution transformers specified in Table 4–2 of the latest Department of Energy standard.
- D. Transformers shall have a minimum of two 2.5% full capacity primary taps above and below rated primary voltage.
- E. Insulation system shall be Class 220 designed for 150°C rise above 40°C ambient. The maximum temperature at the top of the enclosure shall not exceed 50°C rise above 40°C ambient.
- F. Coils shall be continuous wound, impregnated with high quality varnish. Coils shall be securely bonded and braced to resist possible winding displacement.
- G. Cores shall be constructed of highest quality grain-oriented non-aging cold-rolled silicon steel. Magnetic flux densities shall be kept well below the saturation point.
- H. Sound levels shall be guaranteed by the manufacturer to not exceed NEMA Standard. The core and coil assembly shall be isolated from the enclosure by means of rubber vibration absorbing mounts.
- I. Provide rubber vibration absorbing mounts between transformer enclosure and floor.

2.08. WIRING DEVICES

- A. Wiring devices shall be specification grade, all of the same manufacturer, ivory colored.
- B. Lighting switches shall be toggle, AC quiet type rated 20 amps, 120-277 volt.
- C. General purpose receptacles shall be 20 amp, 125 volt, AC, straight blade, 3-wire grounding type.
- D. Ground fault interrupter (GFI) type receptacles shall be duplex, Class A, 15 amp, 125 volt. Provide individual ground fault interrupter type receptacles at each location indicated or as required. Feed-through type protection of multiple outlets will not be allowed.
- E. Special purpose receptacles shall be of the type, ratings and design for the use intended, NEMA configuration.
- F. Surface mounted devices shall have raised surface type covers, galvanized steel.

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- G. Weather-proof receptacles shall be equipped with heavy duty die cast while-in-use covers. Covers shall maintain a weatherproof rating whether or not an attachment plug is inserted. Intermatic WP3110MXD series, or approved equal.
- H. Definite purpose devices shall be labeled with a description of the device's function, rating and circuit identification.
- I. All outlets shall be labeled with the panel and circuit number(s) from which the device is fed. Labels shall be heavy duty adhesive type, clear with black letters on light colored devices and clear with white letters on dark colored devices. Lettering shall be appropriately sized for the application, except minimum $\frac{1}{4}$ inch. Labels on ceiling mounted devices shall be large enough to read from the floor. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.

2.09. EQUIPMENT IDENTIFICATION

- A. Provide nameplates for all equipment and other devices used for the control of circuits, equipment, etc.
 - 1. Panelboards and each feeder circuit breaker within each.
 - 2. Circuit breakers, bus gutter, etc.
 - 3. Motor starters, contactors, etc.
 - 4. Separately mounted circuit breakers.
 - 5. Disconnect switches.
 - 6. Control and contactor panels, and each device within each.
 - 7. Control stations and their devices.
- B. All distribution equipment (switchboard, panelboards, control panels, etc.) shall be provided with laminated plastic nameplates to identify the system color coding scheme for phase and neutral conductors as required.
- C. All distribution equipment (switchboard, panelboards, control panels, etc.) shall be provided with warning nameplates to warn personnel of potential arc flash and shock hazards in compliance with the NFPA 70E standard. Nameplates shall include the voltage system, arc flash boundary limits and PPE category specific to the location.
- D. Definite purpose devices shall be labeled with a description of the device's function, rating and include the panel and circuit number(s) from which it is fed.
- E. All equipment and outlets shall be labeled with the panel and circuit number(s) from which it is fed.

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- F. Labels shall be heavy duty adhesive type, clear with black letters on light colored devices and clear with white letters on dark colored devices. Lettering shall be appropriately sized for the application, except minimum ¼ inch. Labels on ceiling mounted devices shall be large enough to read from the floor. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.
- G. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. and, where applicable, include the panel and circuit number(s) from which it is fed. Nameplate designations shall be consistent with the project documents. Submit proposed inscriptions for approval.

PART 3 - EXECUTION

3.01. TEMPORARY POWER

- A. The contractor shall remove, relocate, and temporarily reconnect the existing Shop Well #1 Generator and sub-base fuel tank.
- B. The Contractor shall provide all temporary power services, facilities, equipment, devices, material, etc. required for the construction; including adequate lighting, outlets, balancing, testing, etc. as may be necessary for the proper performance and inspection of the work.
- C. During power interruptions, and if Contractor's equipment will not operate on the available power, the contractor shall supply all equipment needed, such as transformer(s), generator(s), etc. and pay all costs involved.
- D. The temporary power system shall be provided in a neat and safe manner, in compliance with governing codes and good working practice.
- E. The temporary power system shall be removed when no longer required.

3.02. LOCATIONS

- A. The mounting heights and location of similar equipment and devices shall be consistent, in accordance with the requirements of the ADA where applicable. Special purpose items shall be located conveniently for the purpose intended.
- B. Devices shall be located to not interfere with the removal of pipes or equipment for maintenance or repair. All devices shall be kept a minimum of 6 inches away from items producing heat.
- C. Panels, starters, circuit breakers, etc. shall be wall mounted, 6½ feet to top above the floor. Circuit breakers, etc. shall, in no case, be installed so that the grip of the operating handle, when in its highest position, is more than 6½ feet above the floor or working platform.
- D. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices locations, and obtain specific approval from the Owner and Engineer for the location of each prior to installing enclosures, boxes, raceways, etc.

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- E. Outlets (power, telecommunications, etc.) shall be mounted 18 inches to bottom above finished floor unless noted otherwise; except, outlets above counters, etc. shall be mounted 6 inches to centerline above the counter or 3 inches to centerline above the splashboard, whichever is higher.
- F. Locate light switches, etc. 6 inches from door casings (except on center in spaces less than 12 inches), 42 inches to centerline above finished floor.

3.03. EQUIPMENT AND DEVICES

- A. Equipment, devices, enclosures, etc. shall be installed plumb and true and shall be square with the adjacent walls, ceilings and structural members. The location of similar items shall be consistent.
- B. Equipment, cabinets, boxes, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- C. The correct lifting, jacking and/or moving gear which will prevent damage to the equipment shall be used.
- D. All bolts, nuts, screws and other fastenings shall be tightened and all covers replaced on equipment and boxes. All electrical connections, particularly those on bus work in panelboards, etc. shall be checked to ensure tightness and electrical conductivity. All gaskets, seals, etc. shall be checked for proper fit.
- E. Follow manufacturer's installation details wherever available. Provide all boxes, mountings, wiring or fittings required, standard or special.
- F. The Contractor shall touch-up paint all scratched, marred or damaged factory finish on equipment, devices, enclosures, etc.

3.04. EQUIPMENT TESTING

- A. Before testing, visually inspect equipment thoroughly, and perform mechanical operation tests in accordance with manufacturer's instructions.
- B. Before energization, the insulation resistance of the transformer windings shall be tested with a 500 volt megger. Test primary insulation to ground with tank and secondary winding grounded. Test secondary winding insulation to ground with tank and primary winding grounded. The minimum acceptable insulation resistance to ground is 8 times the KV rating of the winding under test.
- C. Insulation Resistance Tests:
 - 1. Test using a 500 VDC or 1000 VDC megohmmeter.
 - 2. Ground all phases not being tested.

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3. Measure insulation resistance at one minute following the application of the test voltage.
 4. Ground each phase at the completion of the test.
- D. Compare test results with factory-obtained results and results on similar equipment. Investigate variations. Consult manufacturer for recommendations.
- E. Upon completion, all equipment and systems shall be tested for functional operation, including all intended modes and sequences of operation.
- F. Record the values of each test, along with the description of the instrument, voltage level, temperature, time, and date of the test on the form included in the contract documents. Sign the results.

End of Section 26 20 00

SECTION 26 32 13 – ENGINE GENERATOR & AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this section and the other Division 26, 27 and 28 sections apply to all the engine-generator set & automatic transfer switch work.
- B. Coordinate engine-generator and automatic transfer switch work with related work shown and specified elsewhere.
- C. Provide all necessary equipment, devices, materials and appurtenances necessary for proper operation. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. Provide all testing and training.
- E. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for the engine-generator set, automatic transfer switch, fuel tank and all appurtenances.
- B. Provide sizing calculations to support that proposed engine-generator set size and configuration will start and run loads as specified. See Section 26 32 13, 2.03, D, 8, for loads.

PART 2 - PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system.
- B. Engine-Generator Set, Automatic Transfer Switch and all appurtenances shall be manufactured, tested, and shipped by a single supplier, who is a local (not more than 150 miles from site and within the United States) authorized distributor that can provide 24 hour service with factory trained personnel, a required stock of replacement parts, and technical assistance.

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- C. The engine-generator set and automatic transfer switch shall be suitable for use as an emergency and legally required standby power system in accordance with the NEC; and meet the specifications, prototype tests, one-step full-load pickup, and installation acceptance requirements of NFPA 110.
- D. Engine-generator set, automatic transfer switch and all associated equipment, devices, materials, etc. shall be UL (Underwriter's Laboratories, Inc.) listed, labeled and approved for the service intended where UL standards have been established. If no UL label is available, the label of a testing agency or conformance to national standards recognized and approved by the authority having jurisdiction is required.
- E. All equipment, devices, etc. and their components shall be designed for continuous duty without degradation of function or performance.
- F. Provide concrete pad sized per manufacturer's instructions.
- G. Brace all equipment, devices, etc. as required to meet the requirements of the IBC.
- H. Lifting eyes and jacking pads shall be provided.

2.02. WARRANTY

- A. The engine-generator sets, automatic transfer switches and all appurtenances shall be warranted for a period of 5 years or 1,500 operating hours (whichever occurs first) from the date of initial start-up, including travel time. Multiple warranties for individual components (engine, generator, controls, fuel tank, etc.) will not be acceptable.
- B. For warranty purposes, the date of project substantial completion shall be considered the date of final acceptance of the installation by the Owner certified in writing. Corrective work, if needed and requested by the Owner, shall be provided without cost to the Owner during the warrantee period.
- C. All corrective work performed by the Supplier in remedying defective work during the warrantee period following the Owner's acceptance of the project shall be subject to the same warrantee requirements of the original work for a period as specified from the date of completion of the corrective work.
- D. Corrective work shall include on-site service by the supplier and/or nearest technical service representative of the equipment manufacturer. Service shall be provided within 24 hours from the time of request for warranty service by the Owner.

2.03. ENGINE-GENERATOR SET

- A. Engine-Generator Set shall be Cummins 450DFEJ, Caterpillar C18, or approved, diesel fueled, 1800 rpm, 3 phase, 4 wire, 60 hertz, re-connectable (initially connected 480Y/277 volt); rated minimum 450 KW, 562 KVA at 0.8 PF (130°C).
- B. Engine-Generator Set shall meet or exceed the latest local, NWAPA and EPA standards and requirements for noise, emissions and opacity.

C. Engine-Generator Set shall be permanently mounted, outdoors, with weather protective and sound attenuated enclosure, sub-base fuel tank, heavy duty steel base, IBC rated, exhaust muffler, etc. Finish shall be manufacturer's standard.

1. Engine-generator sets shall, when operating under full load, provide a sound level no greater than 75 dba at any location 23 feet (7 meters) from the engine-generator sets.
2. Voltage regulation shall be $\pm 1.0\%$ of rated voltage for any constant load between no load and full rated load.
3. Frequency regulation shall be 5% maximum from no load to full load under varying loads.
4. Random voltage variation under steady-state load conditions shall not exceed $\pm 1.0\%$.
5. Random frequency variation under steady-state load conditions shall not exceed $\pm 0.5\%$.
6. Total harmonic distortion from no load to full linear load shall not exceed 5% of rated voltage, and no single harmonic shall exceed 3% of rated voltage.
7. Telephone influence factor shall be less than 50. Telephone harmonic factor shall be less than 3.
8. Engine-generator set shall be capable of starting minimum 100% load in one step (per NFPA 110), and shall be capable starting and running the connected loads (see panel schedules) in a single step, with an instantaneous voltage drop of no more than 35% as defined by NEMA MG 1. Provide sizing calculations to support the following loads:

1. Shop Well 1 building lighting, misc. = 0.283 KVA
2. Shop Well 1 building HVAC = 17.895 KVA
3. Shop Well 1 building outlets = 0.72 KVA
4. Shop Well 1 building misc. = 0.60 KVA
5. Shop Well 2 building lighting, misc. = 0.283 KVA
6. Shop Well 2 building HVAC = 17.895 KVA
7. Shop Well 2 building outlets = 0.72 KVA
8. Shop Well 2 building misc. = 0.60 KVA

1. Shop Well 1 = 50 HP, Premium Efficiency Motor, Variable Frequency Drive

1. Shop Well 2 = 200 HP, Premium Efficiency Motor, Variable Frequency Drive

1. Engine shall be stationary, liquid-cooled, diesel for use with number 2 diesel fuel. Design shall be 4 cycle, in-line 6 cylinder (with 2 valves per cylinder), minimum 14.9 liters (912 cubic inch), 1800 rpm,

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turbocharged and aftercooled if required. Cylinder block shall be cast iron with replaceable wet liners. Crankshaft and connecting rods shall be forged steel. Engine shall be capable of driving the generator on a continuous standby basis for the duration of any utility source interruption. Fuel injection and valves shall not require adjustment while in service.

2. Engine shall be cooled by a skid mounted, closed loop radiator system; including centrifugal fan, coolant pump(s) and thermostatic temperature control. The coolant system shall be rated for full load operation up to 50°C ambient conditions. The cooling system components and cooling air flows shall be designed to minimize noise.

F. Engine Components/Accessories:

1. Electric starter(s) as required, battery driven, capable of minimum 3 cranking cycles without overheating, before over-crank shutdown.
2. Starting batteries (24 VDC starting system, negative ground) shall be rack mounted inside Engine-Generator Set housing and/or base rails. Battery shall be heavy duty lead acid type with standard top-post connections. Battery cables shall be flexible "welder" type, length and size as required, with standard connectors crimped and sweat soldered at each end. Positive cables shall have red "heat shrink insulation" installed at each termination.
3. Battery charging alternator with solid-state voltage regulator.
4. Positive displacement, mechanical full pressure lubrication oil pump, lubrication oil as required, full flow lubrication oil filters with replaceable elements, dipstick oil level indicator, high quality ball type manual lube oil drain valve to minimize possible leakage, and a quick connect fitting.
5. Oil pressure sensor with normally open contact which closes on oil pressure rise.
6. Fuel filter and water separator, automatic electric fuel shutoff, and an engine driven mechanical positive displacement fuel injection pump, capable of providing sufficient lift and capacity to transfer fuel from the sub-base fuel tank.
7. Dry element air cleaner with filter and restriction indicator.
8. Electronic speed governing system to provide isochronous Engine-Generator Set frequency control.
9. Protection devices with sensing elements to initiate high and low coolant temperature, low lubrication oil pressure, over-speed, over-crank, etc. alarms and shutdowns.
10. Water jacket heater, thermostatically controlled, 208 volt.

G. Generator:

1. Generator shall be single pre-lubricated sealed bearing, self-aligning, four-pole, synchronous, revolving field type, dripproof construction; with amortisseur windings and direct drive centrifugal

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blower. Generator shall be directly connected to engine flywheel housing and driven through a flexible coupling to insure permanent alignment. The rotor shall be dynamically balanced. The armature shall have skewed laminations and two-thirds pitch windings. Generator design shall prevent potentially damaging shaft currents.

2. Insulation system shall be Class H, minimum. Actual temperature rise shall not exceed 130°C, at 40°C ambient.
3. Generator shall be 3 phase, broad range, re-connectable, with 12 leads brought out to allow connection by user to obtain any of the available voltages for the unit.
4. Voltage regulator shall be asynchronous, pulse width modulated design, temperature compensated, torque-matched to the engine. Voltage regulator shall be insensitive to severe load induced waveform distortion from SCR, thyrister, etc. circuits.
5. A permanent magnet generator shall provide excitation power to the automatic voltage regulator. The permanent magnet generator shall sustain main field excitation power for optimum motor starting, and to sustain short circuit current.
6. Exciter shall be three-phase, full-wave rectified, with heavy-duty silicon diodes mounted on the rotor shaft and sized for maximum motor starting loads.
7. Shield generator, exciter, voltage regulator, etc. to prevent radio frequency interference.
8. Engine-Generator Set shall be mounted with vibration isolators on a heavy-duty steel base.

H. Fuel Tank:

1. Fuel tank shall be UL142 listed, sub-base style. Tank shall be corrosion resistant steel, double wall construction, pressure tested, complete with gauges, valves, fill and vent fittings, etc.
2. Engine fuel supply and return lines shall be pre-plumbed, with flexible sections.
3. Fuel tank shall be provided with high and low fuel level alarm switches (interlocked with pump station monitoring system).
4. Fuel tank shall be provided with a level transmitter to provide a 4 - 20 milliamp signal to the pump station monitoring system.
5. Capacity: 24hr full load runtime.
6. Fuel shall be provided by the owner.
7. Provide STD vent that terminates 12 feet above grade with emergency vents outside the sound attenuated housing.

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I. Enclosure:

1. Engine-generator enclosure shall be a weather-protective and sound attenuated housing. Sound level shall not exceed 75 dba at any location 23 feet (7 meters) from the engine-generator set when operating under full load.
2. Housing shall be heavy gauge reinforced sheet steel with sound dampening material, attached the Engine-Generator Sets mounting base and radiator cowlings. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure.
3. Sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two-step electro-coating paint process, or equal. Surfaces of all metal parts shall be primed and painted. Hardware and hinges shall be stainless steel. Fasteners used shall be corrosion resistant.
4. All electrical power and control interconnections shall be made within the perimeter of the enclosure.
5. Coolant and lubricating oil drain lines shall be extended to the exterior of the enclosure, with internal drain valves. Radiator shall have provision for filling from the exterior of the enclosure.
6. Provide lifting brackets as required.

J. Exhaust:

1. Exhaust muffler shall be of the critical noise attenuation type, end or side entry as required, connected to the engine with a flexible exhaust pipe section (length as required to take up thermal expansion and generator set vibration) and a rain cap at the stack outlet. Exhaust muffler shall include a condensate drain.
2. Exhaust pipe shall be schedule 40 black iron pipe, same size as the exhaust outlet of the engine and/or the exhaust muffler; except provide flexible corrugated stainless steel tubing sections as required to take up expansion in long straight runs. A condensate drain and trap shall be provided where the piping turns to rise vertically.
3. Provide a flexible stainless steel exhaust pipe section from the muffler to the engine exhaust connection point, length as required to take up thermal expansion and generator set vibration.
4. Muffler and exhaust piping shall be thermally protected.
5. Exhaust system back pressure shall not exceed the allowable back pressure on the engine-generator sets.
6. Exhaust system noise level shall not exceed 75 dba at 23 feet.

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7. Exhaust system shall meet or exceed the latest local, NWAPA and EPA standards and requirements for emissions and opacity.
8. Provide all necessary exhaust system supports, brackets, etc. Exhaust piping supports shall be non-combustible.

K. Main Output Circuit Breakers:

1. Two (2) main output circuit breakers, mounted at an accessible location within the engine-generator set housing, shall be provided on engine-generator set.
2. Circuit breakers shall be molded-case, thermal magnetic, quick make-quick break type with trip indicating handles, suitable for use as service entrance equipment where required. Multi-pole breakers shall be single-handle, common trip.

L. Engine-generator set shall include a lighted, unit mounted dead-front factory built, wired, tested, and shock-mounted control panel; including, as a minimum, the following functions and devices:

1. Capability of being started automatically from the remote automatic transfer switches.
2. Oil pressure gauge, coolant temperature gauge, charge rate ammeter and running time meter.
3. Voltmeter, ammeter and frequency meter; with selector switch(es) as required to allow meter displays of each generator phase.
4. Manual selector switch: RUN-STOP-REMOTE
5. Field circuit breaker.
6. Automatic engine shut down for over-crank, over-speed, low oil pressure, and high engine temperature fault conditions.
7. Indicator lamps to signal Run, Switch Off (flashing) plus each engine fault and pre-fault alarm condition, in accordance with NFPA 110; except minimum as follows:
 - a. Low oil pressure (alarm)
 - b. Low oil pressure (shutdown)
 - c. Low coolant temperature (alarm)
 - d. High coolant temperature (alarm)
 - e. High coolant temperature (shutdown)
 - f. Low coolant level (alarm or shutdown--selectable)
 - g. Fail to crank (shutdown)
 - h. Fail to start/overcrank (shutdown)
 - i. Overspeed (shutdown)
 - j. Low DC voltage (alarm)
 - k. High DC voltage (alarm)

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- l. Weak battery (alarm)
 - m. Battery charger AC failure
 - n. Low fuel level
 - o. Low fuel shutdown
 - p. High AC voltage (shutdown)
 - q. Low AC voltage (shutdown)
 - r. Under frequency (shutdown)
 - s. Over current (warning)
 - t. Over current (shutdown)
 - u. Short circuit (shutdown)
 - v. Ground fault (alarm)
 - w. Over load (alarm)
 - x. Emergency stop (shutdown)
 8. Fault reset switch to clear fault indications and allow restarting of the engine after shut down faults.
 9. Control relays as required with dry, form C output contacts rated minimum 300 volt, 10 amps shall signal:
 - a. Low Fuel.
 - b. Not in Auto.
 - c. Generator run status.
 - d. Generator Common Alarm.
 2. Include the following alarm conditions in with the common alarm if they are not already provided:
 - a. Battery charger AC failure
 - b. Low battery voltage alarm
- M. Engine-generator sets accessory equipment shall include, as a minimum, the following:
1. Voltage regulated battery charger, equipped with float, taper, and equalize charge settings. Factory mount inside generator set enclosure.
 2. Remote Emergency Shutdown pushbutton, with weatherproof cover.
 3. Guards as required to prevent accidental contact with rotating parts.
 4. Isolation pads (if unit is not already IBC certified).
 5. Rodent screens below/between tank and all other openings to limit access of rodents into the enclosure.
 6. Anchor bolts shall be ASTM A307 steel, hot dipped galvanized, and shall have a 3 inch diameter hook at the embedded end. Size and quantity as required, with embedment no less than 6 inches.
 7. Touch-up paint as required for all scratched, marred or damaged factory finish on equipment, devices, enclosures, etc.

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1.04. REMOTE EMERGENCY SHUTDOWN BUTTON

- A. Emergency shutdown button and box shall be surface mounted, weatherproof, capable of shutting down upon button press, resettable by pulling out the button. Provide engraved nameplate indicating its function.
- B. Mount button remote from generator, except within site and with an unobstructed path of travel.

2.04. AUTOMATIC TRANSFER SWITCHES

- A. Transfer switches shall be automatic type, Cummins type OTPC, Caterpillar CTGD, or approved, rated to carry 100% rated current continuously.
- B. Automatic transfer switches shall be suitable for use as an emergency and legally required standby power system in accordance with the NEC; and meet the specifications, prototype tests, one-step full-load pickup, and installation acceptance requirements of NFPA 110.
- C. Transfer switches shall be over center operation, double-throw construction, positively electrically and mechanically interlocked, mechanically held in both normal and emergency positions, quick make-quick break type with a center "programmed transition" (initially set for 3 seconds, adjustable from 0 - 7.5 seconds) position during switching in both directions, when the load is isolated from both the normal and emergency sources. The transfer switches shall be approved for manual operation under full load by a permanently attached manual operating handle inside the enclosure.
- D. Electric operating means shall be a direct-acting, constant force in both directions, attached to the switching mechanism without the use of gears, cams, or other complex mechanical linkage methods. The transfer switches shall not contain any integral overcurrent devices in the main power circuit. The transfer switches electrical actuator shall have an independent disconnect means to disable the electrical operation during manual switching.
- E. Transfer switches shall be mounted in a separate surface (wall) mounted, dead front enclosure with key locking door, protective covers inside the enclosure to protect operating personnel during manual operation and to allow an operator to visually determine whether the main contacts are open or closed.
- F. Main switch contacts shall be of the no maintenance type, resistant to burning and pitting. Switch shall have arc chutes of heat resistant material and metal leaves for positive extinguishing of arcs quickly and effectively. Arc chutes shall have insulating covers to prevent interphase flashover.
- G. Cable lugs, suitable for both top and bottom feed, shall be provided for normal, emergency, and load positions. Separate full rated neutral and ground bars with lugs for normal, emergency, and load positions shall be provided.
- H. Controls with the following features and/or functions shall be provided:
 - 1. Control accessories, electronic and/or relay, shall be mounted in a separate compartment inside of the main cabinet.

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2. Control circuit disconnects shall be provided to de-energize the control circuits.
 3. Electronic control, undervoltage and time delay modules shall be printed circuit boards for ease of service. Undervoltage sensors shall simultaneously monitor all phases of the normal and emergency power sources. Voltage pickup settings shall be adjustable from 85% to 100% of nominal voltage. Voltage dropout settings shall be adjustable from 74% to 98% of the pickup setting with a fixed dropout delay of 0.5 seconds. Voltage sensors shall be of the temperature compensated type. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase of the normal or emergency power sources, even where motor feedback voltages exist.
 4. Controls shall signal the emergency power system to start upon a signal from the normal source voltage sensors. Time delay (adjustable) start shall avoid nuisance start-ups on momentary voltage dips or interruptions. The transfer switches shall transfer the load to the emergency power system after the engine-generator set reaches proper voltage and frequency and has stabilized, within 10 seconds after a normal source power failure; and shall retransfer the load to the normal source after the normal source is restored and stabilized. The controls shall signal the engine-generator set to shut down after load retransfer to the normal source, but shall maintain the availability of the emergency source in the event the normal source fails shortly after retransfer; except controls shall allow the engine-generator set to run unloaded for a 10 minute cooldown period prior to shutdown.
 5. Controls shall provide an automatic retransfer of the load from the emergency source to the normal source if the emergency source fails when the normal source is available.
 6. Transfer switches operating power shall be obtained from the source to which the load is being transferred.
 7. Status indicators shall be provided to indicate the sequence of control functions.
 8. Main cabinet front door mounted controls and indicator lamps shall consist of oil-tight, position indicator lamps and key operated Test and Selector Switches to provide Test-Normal-Retransfer functions.
- I. Accessories shall include the following:
1. Meters, with a single switch, to monitor the automatic transfer switch output voltage, current and frequency on each phase; mounted in the cabinet front door, and readable without opening the door.
 2. An exerciser clock to set day-of-week (1 week dial minimum), time-of-day, and duration-of-time of engine-generator set exercise.
 3. Control relays as required with dry, form C output contacts rated minimum 300 volt, 10 amps shall signal:
 - a. ATS in Utility Power Position
 - b. ATS in Generator Power Position.
 - c. ATS fail to transfer.
 4. Voltage regulated battery charger, equipped with float, taper, and equalize charge settings.

SECTION 26 32 13 – ENGINE GENERATOR & AUTOMATIC TRANSFER SWITCHES

2.05. EQUIPMENT IDENTIFICATION

- A. Provide nameplates for all equipment and other devices used for the control of circuits, equipment, etc.
- B. Engine-generator set enclosure doors where the circuit breakers and control panels are located.
- C. Circuit breakers.
- D. Automatic transfer switches.

PART 3 - EXECUTION

3.01. LOCATIONS

- A. The mounting heights and location of similar equipment and devices shall be consistent, in accordance with the requirements of the ADA where applicable. Special purpose items shall be located conveniently for the purpose intended.
- B. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and device locations, and obtain specific approval from the Owner and Architect for the location of each prior to installing enclosures, boxes, raceways, etc.
- C. Transfer switches, circuit breakers, etc. shall, in no case, be installed so that the grip of the operating handle, when in its highest position, is more than 6¹/₂ feet above the floor or working platform.

3.02. EQUIPMENT AND DEVICES

- A. Equipment, enclosures, etc. shall be installed plumb and true and shall be square with the adjacent walls, ceilings and structural members. The location of similar items shall be consistent.
- B. Equipment, cabinets, boxes, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- C. The correct lifting, jacking and/or moving gear which will prevent damage to the equipment shall be used.
- D. All bolts, nuts, screws and other fastenings shall be tightened and all covers replaced on equipment and boxes. Electrical connections shall be checked to ensure tightness and electrical conductivity. Gaskets, seals, etc. shall be checked for proper fit.
- E. Follow manufacturer's installation details wherever available. Provide all boxes, mountings, wiring or fittings required, standard or special.
- F. Brace all equipment, etc. as required to meet the requirements of seismic zone 3.

SECTION 26 32 13 – ENGINE GENERATOR & AUTOMATIC TRANSFER SWITCHES

- G. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- H. Provide concrete pad sized per manufacturer's instructions.
- I. Pad mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.
 - 1. Engine-generator set anchor bolts size and location shall be as directed by engine-generator set supplier.
 - 2. Engine-generator set anchor bolts shall be ASTM A307 steel and shall have a 3 inch diameter hook at the embedded end. Embedment shall be no less than 6 inches.
- J. The Contractor shall touch-up paint all scratched, marred or damaged factory finish on equipment, devices, enclosures, etc.

3.03. TESTING

- A. Engine-generator sets shall have been tested as complete units on representative engineering prototype models as required by NFPA 110. The tests must not be performed on equipment to be sold, but on separate prototype models, and their accomplishment certified by means of documentation of the tests accompanying submittal data. These tests shall have included:
1. Maximum power level (maximum KW).
 2. Maximum motor starting capacity (maximum KVA) and voltage dip recovery within 7 cycles of applied load.
 3. Structural soundness (Short-Circuit and Endurance Tests).
 4. Torsiograph Analysis.
 5. Engine-generator cooling air flow.
 6. Transient response, steady-state speed control and voltage regulation.
 7. Generator temperature rise.
 8. Harmonic analysis and voltage waveform deviation.
 9. Three-phase short-circuit test.
 10. Failure mode test for voltage regulator.
 11. Endurance test.

B. Before shipment, engine-generator sets shall be tested under rated load and power factor for performance and proper functioning of control and interfacing circuits. Testing at unity power factor only (resistance banks) is not acceptable. Tests shall include:

1. Single step load pickup.
2. Transient and voltage dip responses, and steady state voltage and speed (frequency) checks.
3. Generator temperature rise.

C. The completed installation shall be initially started-up and checked-out for operational compliance by a factory-trained representative of the manufacturer.

D. Operating Load Tests:

1. Upon completion of initial start-up and system checkout, the supplier of the Engine-Generator Set and Automatic Transfer Switches shall perform field tests (with the Owner and Engineer notified a minimum of 48 hours in advance) to demonstrate load carrying capability, and voltage and frequency stability. With the emergency load at normal operating level, a power failure shall be initiated by turning off the circuit breaker supplying normal power to the Automatic Transfer Switches.
2. Records shall be maintained throughout the tests of time-of-day, coolant temperature, cranking time until engine starts, time required to come up to operating speed, voltage and frequency overshoot, time required to achieve steady-state conditions, voltage, frequency, current, oil pressure, ambient air temperature, kilowatts, power factor, battery charge rate, etc.
3. Continue load tests for 2 hours, observing and recording load changes and the resultant effect on voltage and frequency, then return normal power. (Record the time delay on retransfer, and the engine cooldown period and shutdown.)
4. Upon completion of the above tests, allow the engine to cool for 5 minutes; then apply full rated load (nameplate KW) consisting of facility load supplemented by a load bank. Simulate power outage testing of emergency and stand-by loads to ensure that all loads get picked up as planned. Coordinate schedule of test with Owner so that critical equipment and services is not affected. Observe for proper operation and continue for 2 hours. Ensure that all loads transfer back to normal utility power and are picked up as planned. (Unity power factor is suitable for on-site testing, provided that rated load tests at power factor have been performed by the manufacturer prior to shipment.)

E. Tests shall be performed to demonstrate the operation of the cranking cycles, and all safety devices.

F. Testing will not be allowed when the existing building is occupied. Testing shall not be done without prior approval and scheduling with the Owner.

G. Generator testing causing systems interruptions, whether to individual equipment or to the entire system, shall not be done without prior approval, scheduling and meeting with the Owner. Generator testing

SECTION 26 32 13 – ENGINE GENERATOR & AUTOMATIC TRANSFER SWITCHES

interruptions that affect operation of the existing facility shall not be done during normal working hours. Some working of non-standard or longer than standard hours will be required, without increase in Contract Sum.

- H. All systems shall test free from shorts and grounds and shall be without mechanical and electrical defects. If any test indicates a failure, in the opinion of the Engineer; the item shall be replaced or suitably repaired to the approval of the Engineer, and the test repeated without additional cost to the Owner.

3.04. TRAINING, INSTRUCTION AND ASSISTANCE

- A. After the installation is complete and operating, and prior to acceptance of the work, Contractor shall conduct instruction period(s) at the site, to point out locations of service and maintenance, and instruct the Owner's representatives in the operation of all systems and equipment.
- B. The person(s) who conduct these instructions and demonstrations shall be manufacturer's representatives with substantial training and operating experience on this equipment and project. Their qualifications shall be submitted to the Owner before conducting the instruction period.
- C. Each period shall include preliminary discussion and presentation of information using the actual maintenance manuals required for this project. Contractor shall notify Owner at least 48 hours in advance of readiness to conduct the instruction period. The actual time and date of instruction period shall be acceptable to the Owner and the Contractor.

End of Section 26 32 13

SECTION 26 50 00 – LIGHTING

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27, and 28 Sections apply to all the lighting and lighting control work.
- B. Coordinate lighting and lighting control work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. QUALITY ASSURANCE

- A. The lighting systems and all controls shall be in accordance with the Washington State Non-Residential Energy Code (NREC).

1.04. SUBMITTALS

- A. Provide submittals for the following:
 - 1. Lighting fixtures.
 - 2. Photocells.

PART 2 - PRODUCTS

2.01. LIGHTING

- A. Light Emitting Diode (LED) luminaires shall have a luminous efficacy of at least 90 lumens/W, a CRI of at least 80, an estimated life of at least 50,000 hours at 70% lumen maintenance, and shall include a minimum 5-year warranty on the entire luminaire including the driver. The luminaire and LEDs shall have been tested in accordance with LM-79 and LM-80.
- B. Fixtures, luminaires, etc. shall include all necessary mounting and connecting accessories.

SECTION 26 50 00 – LIGHTING

- C. Photocells shall be 120/208/277 volt, minimum 2000 watt, conduit mount, with diecast zinc housing with slider adjustable ON/OFF range. Tork 2100 series, or approved equal.
- D. Motion sensor wall switches shall be ultrasonic or passive infrared type, wall mounted, ivory colored, 120-277 volt, rated minimum 1200 watt, adjustable sensitivity, adjustable time delay, switch for manual control and vandal resistant hard lens. Buttons on the face of the switches shall operate in toggle mode to manually turn on/off connected lighting loads. Motion sensor switches shall be Watt-Stopper type WI-200 or Hubbell type LHMTS1 for single switch/level applications, or approved equal.

PART 3 - EXECUTION

3.01. LOCATIONS

- A. Locate light switches, etc. 6 inches from door casings (except on center in spaces less than 12 inches), 42 inches to centerline above finished floor.

3.02. MOUNTING AND SUPPORTS

- A. Fixtures, luminaires, etc. shall be installed plumb and true and shall be square with the adjacent walls, ceilings and structural members. The location of similar items shall be consistent.
- B. Fixtures, luminaires, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- C. Follow manufacturer's installation details wherever available. Provide all boxes, mountings, wiring or fittings required, standard or special.
- D. The Contractor shall touch-up paint all scratched, marred or damaged factory finish.

End of Section 26 50 00

SECTION 27 00 10 – PROCESS CONTROL AND INSTR. – GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 REQUIREMENTS

- A. The Contractor shall furnish, install and connect all Process Control and Instrumentation Systems (PCIS) complete and operable, in accordance with the Contract Documents.
- B. The requirements of this Section apply to all components of the PCIS unless indicated otherwise.
- C. Definitions
 - 1. CONTRACTOR:
 - a. The Contractor and/or their Electrical Sub-Contractor, as distinct from the System Integrator Sub-Contractor, shall install and connect the equipment and other components furnished by the System Integrator, as listed generally in Section 26, and shall furnish, install and connect all additional materials and work as necessary to supplement the materials and work provided by the System Integrator, and shall satisfy all requirements that are within the scope of this section. Vendor or local control panels shall be furnished by equipment manufacturers as described in the equipment Specifications, then installed and connected by the Contractor. The Contractor shall furnish, install and connect all instruments and components specified herein that are not to be assembled as part of the PCIS, or that are not otherwise listed as specifically being furnished by the System Integrator.
 - 2. SYSTEM INTEGRATOR:
 - a. A Sub-Contractor to the Contractor, who shall design the PCIS system, provide and assemble the Telemetry Control Panel and Motor Control Center, provide start-up and training services for the entire PCIS described herein. Pre-approved System Integrators shall be:
 - (i) Technical Systems, Inc., 2303 196th Street, Lynnwood, WA 98036,
Phone: (425) 775-5696. Contact Mitch Stewart.
 - (ii) Quality Controls Corporation, 5015 208th St, Suite 1B, Lynnwood, WA 98036
Phone: (425) 778-8280. Contact David Chu
 - (iii) Process Solutions, Inc., 7112 265th St NW, Stanwood, WA 98292
Phone: (360) 403-7037. Contact David Crumpley.
 - 3. SYSTEM PROGRAMMER:
 - a. A single firm, as a Sub-Contractor to the Contractor, who shall program the PCIS system, provide configuration and setup for the Motor Control Center, provide start-up and training services for the programming and control of the entire PCIS described herein. The System Programmer shall be Technical Systems, Inc., 2303 196th Street, Lynnwood, WA 98036,

SECTION 27 00 10 – PROCESS CONTROL AND INSTR. – GENERAL REQUIREMENTS

Phone: (425) 775-5696. Contact Mitch Stewart.

D. Responsibilities

1. Contractor: through the use of the System Integrator, System Programmer, and qualified electrical and mechanical installers, shall be responsible to the Owner for the implementation of the PCIS and integration of the PCIS with other required instrumentation and control devices. The System Integrator shall furnish the instrumentation, complete, to the Contractor for installation and connection. The System Programmer shall program the PLC's, VFD's and HMI products supplied by the System Integrator. The Contractor shall be responsible for furnishing, installing and connecting all conduit, appurtenances, conductors, conductor terminations, mounting brackets and hardware in addition to installing and connecting instrumentation and all equipment listed in the Contract Documents.
2. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these specifications that the System Integrator and System Programmer be responsible to the Contractor for the integration and programming respectively of the PCIS with devices furnished under other sections with the objective of providing an integrated control system, free of signal incompatibilities, and completely operable and suitable for the purpose intended, as specified herein.
3. System Integrator: as a minimum, the System Integrator shall perform the following work:
 - a. Implementation of the PCIS.
 - (i) Prepare PCIS hardware submittals.
 - (ii) Design, develop, and electronically draft loop drawings and control panel designs.
 - (iii) Prepare the test plan, the training plan, and the spare parts submittals.
 - (iv) Provide equipment for the programmable logic controller (PLC) hardware.
 - (v) Procure equipment for, fabricate and wire the following: Telemetry Control Panel, Motor Control Center (MCC), Flowmeter, Pressure Transmitter, Pressure Switch(s).
 - (vi) Perform factory tests for the Telemetry Control Panel, Motor Control Center (MCC), Variable Frequency Drive, and obtain the Owner's acceptance of the PCIS work.
 - (vii) Oversee and certify installation.
 - (viii) Provide on-site engineer to oversee, document, and certify loop testing.
 - (ix) Provide on-site engineer to oversee, document, and certify system commissioning.
 - (x) Provide on-site engineer to conduct the performance test.
 - (xi) Document all operators' setpoints as set at the end of commissioning.

SECTION 27 00 10 – PROCESS CONTROL AND INSTR. – GENERAL REQUIREMENTS

- (xii) Prepare Operation & Maintenance Manuals.
 - (xiii) Conduct training classes not to exceed eight (4) hours.
 - (xiv) Prepare record drawings and drafting file record copies.
 - b. Integration of the PCIS with instrumentation and control devices being provided under other sections;
 - (i) Develop all requisite loop drawings and record loop drawings associated with equipment provided under other Divisions of these Specifications and Owner furnished equipment.
 - (ii) Resolve signal, power, or functional incompatibilities between the PCIS and interfacing devices.
 - (iii) Any System Integrator responsibilities in addition to the list above are at the discretion of the Contractor and the System Integrator. Additional requirements in this Section or in Divisions 26, which are stated to be the Contractor's, responsibility may be performed by the System Integrator if the Contractor and System Integrator so agree.
- 4. System Programmer: as a minimum the System Programmer shall perform the following work:
 - a. Programming for the Shop Well #2 PLC control system.
 - (i) Perform programming of the Shop Well #2 programmable logic controller (PLC), which shall include adding synonym tag names, block diagrams, software interface with the SCADA software, etc.
 - (ii) Perform communications programming for Water Plant Main Control Panel, Shop Well #2 Telemetry Control Panel, and Motor Control Center for operation of the Water Treatment Systems.
 - (iii) Perform SCADA programming including display and trending screens for all required variables.
 - b. Programming for the WTP PLC and HMI System.
 - (i) Perform programming of the WTP programmable logic controller, which shall include adding synonym tag names, block diagrams, software interface with the SCADA software, etc.
 - (ii) Perform HMI programming and network switch configuration, including creation of new well site status display, alarm display, and trend display. Add datalogging for assigned variables. Configure network hardware for backup radio communications.
 - (iii) Any System Programmer responsibilities in addition to the list above are at the discretion of the Contractor and the System Programmer. Additional requirements in this Section, which are stated to be the Contractor's, responsibility may be performed by the System Programmer if the Contractor and System Programmer so agree.

1.02 CONTRACTOR SUBMITTALS

SECTION 27 00 10 – PROCESS CONTROL AND INSTR. – GENERAL REQUIREMENTS

- A. General: Submittals shall be furnished in accordance with Section 26 00 10 1.07 - Submittals and the following:
1. The Contractor shall coordinate the instrumentation work so that the complete Instrumentation and control system will be furnished and will be supported by accurate shop drawings and record drawings. All PCIS submittals shall be routed through the Contractor to the engineer. Submittals shall be provided for the following:
 - a. Motor Control Center (MCC).
 - b. Shop Well #2 Telemetry Control Panel
 - c. Pressure Indicating Devices.
 - d. Flow Indicating Transmitters.
 - e. Well Level Transmitters.
 - f. Security and Fire Alarm devices.
 - g. Intrusion Switches.
 2. Exchange of Technical Information: During the period of preparation of these submittals, the Contractor shall authorize a direct, informal liaison with the Owner for exchange of technical information. As a result of this liaison, certain minor refinements and revisions in the systems as indicated might be authorized by the Owner but shall not alter the scope of work or cause increase or decrease in the Contract Price or Contract Times. During this informal exchange, no oral statement by the Owner shall be construed to give approval of any component or method, nor shall any statement be construed to grant exception to or variation from these Contract Documents. The System Integrator shall within one (1) working day, notify the Owner and Contractor of any information or items which could change the scope or cost of the System Integrator's service.
 3. Symbols and Nomenclature: In these Contract Documents, all systems, all meters, all instruments, and all other elements are represented schematically, and are designated by symbology as derived from Instrument Society of America Standard ANSI/ISA S5.1 - Instrumentation Symbols and Identification. The nomenclature and numbers designated herein and, on the drawings, shall be employed exclusively throughout shop drawings, and similar materials. No other symbols, designations, or nomenclature unique to the manufacturer's standard methods shall replace those prescribed above, used herein, or on the Drawings.
 4. Nameplates: The System Integrator shall furnish and install nameplates for all local control panels, panel mounted and non-panel mounted equipment, equipment provided under Division 27, and Owner provided equipment. The Contractor shall furnish and install nameplates for all vendor control panels, vendor-supplied equipment, panelboards and equipment provided under sections in other Divisions. Nameplate format, size, color and material shall be consistent regardless of supplier. Submit a complete listing of all nameplates, including locations, to the Owner for review before manufacturing any nameplates.
- B. Shop Drawings.

SECTION 27 00 10 – PROCESS CONTROL AND INSTR. – GENERAL REQUIREMENTS

1. General:

- a. All shop drawings shall include the letterhead or title block of the System Integrator. The title block shall include, as a minimum, the System Integrator's registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing.
- b.
- c. Organization of the shop drawing submittals shall be compatible with eventual submittals for later inclusion in the Owner's Manual. Submittals not so organized and incomplete submittals for a given loop will not be accepted and will be returned to the Contractor marked "Unreviewable".
- d.
- e. Interfaces between instruments, motor starters, control valves, variable speed drives, flow meters and other equipment related to the PCIS shall be included in the shop drawing submittal.

2. Hardware Submittal: The Contractor shall submit a Hardware Submittal as a complete bound package at one time within 30 calendar days after the commencement date stated in the Notice to Proceed. At minimum the Hardware Submittal shall include:

- a. A complete index which lists each device by item number, type, and Manufacturer. A separate technical brochure or bulletin shall be included with each instrument data sheet. The data sheets shall be indexed in the submittal by item number, as a separate group for each system or loop. If, within a single system or loop, a single instrument is employed more than once, one data sheet with one brochure or bulletin may cover all identical uses of that instrument in that system. Each brochure or bulletin shall include a list of tag numbers for which it applies. Labeled tags shall separate system groups.
 - (i) Completed instrument data sheets for each component, together with a technical product brochure or bulletin. The technical product brochures shall be complete enough to verify conformance to all Contract Document requirements. Data sheets shall, as a minimum, show:
 - (ii) Component functional description used in the Contract Documents.
 - (iii) Manufacturer's model number or other product designation.
 - (iv) Input and output characteristics.
 - (v) Scale, range, units, and multiplier (if any).
 - (vi)
 - (vii) Requirements for electric supply (if any).

SECTION 27 00 10 – PROCESS CONTROL AND INSTR. – GENERAL REQUIREMENTS

- (viii)
- (ix) Materials of component parts to be in contact with or otherwise exposed to process media and corrosive ambient air.
- (x)
- (xi) Special requirements, features or parameters.
- b. Instrument installation, mounting, and anchoring details shall be submitted. As a minimum, each detail shall have the following contents;
 - (i) Show all necessary sections and elevation views required to define instrument location by referencing building or equipment names and numbers, and geographical qualities such as north, south, east, west, first floor, etc.
 - (ii) Ambient temperature and humidity of the environment that the instrument is to be installed in.
 - (iii) Corrosive qualities of the environment and that the instrument is to be installed in.
 - (iv) Process line pipe or tank size, service and material.
 - (v) Process tap elevation and location.
 - (vi) Upstream and downstream straight pipe lengths between instrument installation and pipe fittings and valves.
 - (vii) Routing of tubing and identification of supports.
 - (viii) Mounting brackets, stands, and anchoring devices.
 - (ix) Conduit entry size, number, location, and delineation between power and signal.
 - (x) NEMA ratings of enclosures and all components.
 - (xi) Clearances required for instrument servicing.
 - (xii) List itemizing all manufacturer makes, model numbers, quantities, lengths required, and materials of each item required to support the implementation of the detail.
- 3. Test Procedure Submittals
 - a. The Contractor shall submit the proposed procedures to be followed during tests of the PCIS and its components.
 - b. Outlines of the specific proposed tests and examples of proposed forms and checklists.
- 4. Training Submittals: The Contractor shall submit a training plan which includes:
 - a. Schedule of training courses including dates, durations and locations of each class.

C. Owner's Manual:

SECTION 27 00 10 – PROCESS CONTROL AND INSTR. – GENERAL REQUIREMENTS

1. General: Information in the Owner's Manual shall be based upon the approved shop drawing submittals as modified for conditions encountered in the field during the work.
 2. The Owner's Manual shall have the following organization for each process:
 - a. Section A – Bill of Material
 - b. Section B - Instrument Data Sheets – Cut Sheets
 - c. Section C – Manufactures Manuals
 - d. Section D - Process and Instrumentation Diagrams
 - e. Section E – Shop & Loop Drawings
- D. Record Drawings
1. The Contractor shall keep current a set of complete loop and schematic diagrams which shall include all field and panel wiring, piping and tubing runs, routing, mounting details, point-to-point diagrams with cable, wire, tubes and termination numbers. These drawings shall include all instruments and instrument elements. All such drawings shall be submitted for review prior to acceptance of the completed work by the Owner.

1.03 EXTENDED PERIOD FOR CORRECTION OF DEFECTS

- A. The System Integrator shall correct all defects in the PCIS upon notification from the Owner for a period of one (1) year from the date of Substantial Completion. Corrections shall be completed within 5 business days after notification.

END OF SECTION

SECTION 27 05 00 – COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 – GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to the telecommunications systems work.
- B. Coordinate SCADA and telecommunications systems work with related work shown and specified elsewhere.
- C. The existing SCADA and telecommunications system shall be maintained and modified to accommodate the new work.
- D. This project will connect the new Shop Well #2 to the existing Shop Well #1 via fiber optic cable to integrate the new Shop Well #2 into the City's SCADA system.
 - 1. The owner will perform patching of new fiber optic cables into the existing Shop Well #1 patch panel.
- E. The Contractor shall perform all the work required (including the furnishing of all supervision, labor, services, tools, materials and equipment and the performance of all operations and incidentals necessary) for a complete, safe and reliable telecommunications system installation, adjusted, tested and ready for operation. The work is generally described as follows:
 - 1. Scheduling and coordination of all phases/sequences of the project.
 - 2. Maintaining, modifying, and temporary work to accommodate all phases/sequences of the project.
 - 3. Modifications to existing system.
 - 4. Fiber optic data backbone cabling.
 - 5. Supports.
 - 6. Patch cords, jumpers, cross-connects, etc. (copper and fiber).
 - 7. Grounding.
 - 8. Individual and/or combination data stations/outlets and associated cables, etc.
 - 9. Terminating all cables on both ends - data, grounding, backbone, station, copper, fiber optic, etc.
 - 10. Moisture, fire and dust stopping and sealing.

SECTION 27 05 00 – COMMON WORK RESULTS FOR COMMUNICATIONS

11. Nameplates and labeling.
 12. Equipment, device, cabling, etc. identification and records.
 13. Testing and completing.
 14. As-built drawings.
 15. Obtaining, and paying for all required licenses, permits, inspections, plan review and other fees, etc.
- F. Work not included: The following electrical system related work will be provided by the Owner, General Contractor, other Subcontractors, or Systems Contractors working directly with the Owner:
1. Owner: Plugging in data patch cables and cross-connects into owner's operating system. The contractor is not allowed to plug into the owner's operating telecommunications system.

1.03. DEFINITIONS

- A. The word "Telecommunications" refers to all forms of information transport and processing, such as voice (telephone), data (computer network), etc.
- B. The word(s) "Station" or "Station Outlet" refers to all combination telecommunications outlets.
- C. The word(s) "Station" or "Station Cables" refers to all CAT6A horizontal cables.
- D. The word "Backbone" refers to the cabling, connections, etc. between telecommunications rooms.
- E. The term "Contractor" used throughout this section of these specifications and on the telecommunications drawings shall be understood to mean the Telecommunications Contractor. All other work shall be called out by name.
- F. "Approved" means approved by the Architect. "For approval" means for the Architect's approval.
- G. "Furnish" means to supply and deliver to the Project, ready for installation and in operable condition.
- H. "Install" means to incorporate in the work in final position, complete, anchored, connected, and in operable condition.
- I. "Provide" means furnish and install.
- J. "As directed" means as directed by the Architect.
- K. "Concealed" means hidden from sight in trenches, walls, chases, ceilings, etc.
- L. "Exposed" means within sight; that is, not concealed as defined above, and installed on the surface of walls, ceilings, etc.

SECTION 27 05 00 – COMMON WORK RESULTS FOR COMMUNICATIONS

- M. “C.O.” means conduit only; that is, without cable (except, provide pull string).
- N. “F.O.I.C.” means Furnished by Others (e.g. general contractor, other subcontractors, equipment suppliers, Owner, systems contractors working directly with the Owner, etc.), Installed by Contractor.
- O. Definitions of all other terms, etc. are in accordance with AIA, ANSI, IEEE, IES, NEMA, etc. standard definitions.

1.04. DRAWINGS AND SPECIFICATIONS

- A. The telecommunications plan drawings are general in form and do not attempt to show complete details or list every item of the telecommunications systems, the building construction or the various equipment; however, the routing of raceways and circuits, and the locations of equipment, devices, fixtures, etc. represent the desired finished arrangement; except, as governed by structural or mechanical conditions or obstructions.
- B. Specifications are, in some cases, written in an abbreviated form. Words such as shall, shall be, the Contractor shall, and similar mandatory phrases are supplied by inference.
- C. Investigate the structural and finish conditions affecting the work. Refer to the architectural, structural and mechanical drawings, supplier shop drawings and submittals, etc. for additional details, equipment ratings, dimensions, location and swing of doors, location and size of partitions, cabinets, etc. and similar features. Verify all dimensions, equipment ratings, etc. with the actual before installation. Arrange the work accordingly.
- D. The intent of the drawings and specifications is to include all items necessary for the proper execution and completion of the Work; however, any item or detail not specifically mentioned in the specifications or shown on the drawings, but which is necessary to produce the intended results shall be included.
- E. The Contractor shall bring to the Architect’s and Engineer’s attention any discrepancies within the Contract Documents, between the Contract Documents and field conditions, and any design and layout changes required due to specific equipment selection, etc. prior to equipment and material purchasing and installation. Corrective work necessitated by discrepancies after purchasing and installation shall be at the Contractor’s expense.
- F. Verify all equipment and device locations with the Owner and Architect prior to rough-in

1.05. SUBMITTALS

- A. Provide product submittals for the following:
 - 1. SCADA and data fiber backbone cable.
 - 2. Fiber backbone cable termination hardware.
 - 3. Patch cables.
 - 4. Labels.

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- B. The Contractor shall submit proposed procedures and equipment to be used in testing data and fiber optic cabling along with samples of the reporting format from a past similar project.
- C. Provide qualification information for persons installing and testing the components (equipment, devices, materials, etc.) of each system, indicating their capabilities and experience. Include evidence of applicable registration or certification.

1.06. RECORD DOCUMENTS

- A. Submit "as-built" record drawings and operation and maintenance manuals at completion of the project in accordance with the specific submittal requirements listed elsewhere in these Specifications.
- B. Provide cable test results in software form. Include the necessary viewing software for all test reports.

1.07. "AS BUILT" DRAWINGS

- A. "As-built" drawings shall include cable ID codes for each outlet/receptacle and changes to cable routing, raceway system, telecom room layout, riser diagram, etc.
- B. Include any detailed equipment, raceway, wiring, etc. diagrams and layouts prepared by Contractor or his subcontractors, suppliers, etc.

1.08. WARRANTY

- A. The complete installation shall be guaranteed for a period of one (1) year after date of project completion. For warranty purposes, the date of project completion shall be considered the date of final acceptance of the installation by the Owner certified in writing, and after Owner has received all project close-out requirements. All corrective work, if needed and requested by the Owner, shall be provided without cost to the Owner during the guarantee period.
- B. The contractor shall provide the manufacturer 20-year Extended Product Warranty on the completed voice and data cable infrastructure end-to-end solution.
- C. The contractor shall provide any available third party or manufacturer warranties on the installation.

1.09. QUALITY ASSURANCE

- A. Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with telecommunications infrastructure, systems, equipment, devices, materials, etc. and the required methods of installation.

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B. Contractor Qualifications:

1. The Contractor shall be a "specialist", who is regularly engaged in the type of work specified herein. Award will be made only to a bidder who can provide satisfactory evidence that he has the technical ability, experience, tools, personnel and financial resources to successfully complete the project as specified herein. The Contractor shall have an experience base of at least five (5) years for installation of equipment and related wiring/cabling similar to those proposed on this project.
2. The Contractor shall be registered and certified with the manufacturer of the voice and data end-to-end solution, and shall be capable of providing the required warranty.
3. It is desirable, although not required, for the installer to employ on this project one or more certified technicians as follows:
 - a. Registered Communications Distribution Designer (RCDD), certified by the Building Industry Consulting Service International (BICSI).
4. The Contractor shall engage experienced testing technicians for the purpose of testing the cabling systems. If requested by the Owner, the Contractor shall submit qualifications of the cable testing technician(s) for Owner review and acceptance.
5. The Contractor shall be licensed and bonded in the State of Washington.

C. Manufacturer Qualifications: Engage firms experienced in manufacturing components and materials listed and labeled under the applicable TIA/EIA standards (accepted, proposed or draft).

D. Installation, equipment and materials shall be in accordance with all applicable codes, standards and regulations; including the latest editions and addenda of the following:

1. National Electrical Code (NEC), ANSI/NFPA 70, adopted and amended by RCW 19.28, WAC 296-4 and WAC 296-401: Laws, rules and regulations for installing network cabling and related components and equipment.
2. ANSI/NECA/BICSI 568-2006 – Installing Commercial Building Telecommunications Cabling.
3. ANSI/TIA/EIA 526-7-98 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
4. ANSI/TIA/EIA 526-14-A-98 – Optical Power Loss Measurements of Installed MultiMode Fiber Cable Plant
5. TIA/EIA TSB-125 – Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning.
6. TIA/EIA TSB-140 – Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
7. ANSI/TIA/EIA 568-C.0 – Generic Telecommunications Cabling for Customer Premises.

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8. ANSI/TIA/EIA 568-C.1 - Commercial Building Telecommunications Cabling Standard.
9. ANSI/TIA/EIA 568-C.2 - Commercial Building Communications Cabling Standard, Balanced Twisted Pair Cabling Components.
10. ANSI/TIA/EIA 568-C.3 – Optical Fiber Cabling Components Standard.
11. ANSI/TIA/EIA 569-B - Commercial Building Standard for Telecommunication Pathways and Spaces.
12. ANSI/TIA/EIA 598-B – Optical Fiber Cable Color Coding.
13. ANSI/TIA/EIA 606-A – Administration Standard for Commercial Telecommunications Infrastructure.
14. ANSI/TIA/EIA 607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications.
15. ANSI/TIA/EIA 758 – Customer-Owned Outside Plant Telecommunications Cabling Standard.
16. IEEE 802.3-2002 – IEEE Standard for Information Technology, Part 3: CSMA/CD.

PART 2 – PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system. Match components for optimum performance and appearance.
- B. Horizontal cabling infrastructure shall be selected and constructed as a complete end-to-end solution by Amp, Hubbell, Panduit or OCC.
- C. Unless sizes and/or quantities are specifically indicated, provide at least 20% spare wiring capacity in all cabinets, panels, cable trays and raceways.
- D. All telecommunications equipment, devices, materials, etc. shall be new and installed only if in first class condition.
- E. All wire and cable installed in below grade raceways shall be suitable for wet locations.

2.02. SCADA AND DATA (COMPUTER NETWORK) FIBER BACKBONE CABLES

- A. SCADA and Data backbone cable shall be fiber optic cable, single-mode breakout type, with 6 strands of 9/125 µm single-mode fibers, tight buffered, suitable for use either inside or in outside plant applications. Cables shall consist of multiple sub-cables helically stranded around a central dielectric strength member, aramid fillers as required and an outer jacket.

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- B. Sub-units shall be tight buffered optical fiber, 900 μ m diameter, with aramid yarn strength filler and jacket, color coded per TIA/EIA - 598A to provide easy identification of fibers, and designed for direct termination to standard connectors.
- C. Fibers shall be free of surface imperfections and inclusions, and comply with the applicable sections of TIA/EIA - 455, - 472, - 492, - 568A and - 598A.
- D. Optical characteristics:
 - 1. 9/125 μ m, .5/.5 single-mode fibers
 - a. Gigabit Ethernet capable: 5 km @ 1310 nm, and 5 km @ 1550 nm.
 - b. 10 Gigabit Ethernet capable: 10 km @ 1310 nm, and 10 km @ 1550 nm.
 - c. Maximum attenuation: = 0.5 dB/km @ 1310 nm, and 0.5 dB/km @ 1550 nm.
 - d. “Low Water Peak” attenuation characteristics.
 - e. ISO/IEC 11801 designation: OS2.
 - f. Optical Cable Corporation fiber code SLX.
- E. All fibers shall be subjected to a minimum proof test of 0.7GPa.
- F. Fiber optic cable shall be Optical Cable Corporation DX series, Corning Freedom One Riser series, General Distribution Riser series, or approved equal.

2.03. FIBER OPTIC TERMINATION HARDWARE

- A. SCADA AND DATA BACKBONE FIBER OPTIC CABLE CONNECTORS:
 - 1. Single-mode fiber optic cable connectors shall be factory assembled pigtails terminated with type SC-UPC ultra polished connectors with ceramic insert alignment sleeves and blue in color. Return loss shall be 65 dB or better. Fusion splice pigtails to backbone fiber optic cables. Pigtails shall be 2 meter jumpers cut in half to make 2 pigtails.
 - 2. All fibers in each cable shall be terminated to connectors, couplings, etc. as required in optical fiber enclosures.
- B. Optical fiber terminations in existing enclosures shall be made using 6 connector panels specifically suitable for use with the existing enclosure.

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2.04. EQUIPMENT AND CROSS-CONNECT CABLES

- A. Data cross-connect cables and data line cords shall be 4-pair UTP, Category 6, booted patch cords with factory terminated RJ-45 connectors on both ends. Connectors shall be booted to prevent snagging of the insertion tab. Cables shall conform to industry standards for CAT6 horizontal cable & termination hardware. Cable shall be made by the same manufacturer as the data station cable and horizontal termination hardware. Cables shall be of sufficient length to connect the data equipment to the horizontal cabling patch panel. Contractor may not elect to field terminate cross-connect cables.
 - 1. Provide quantity of cables as required for a fully connected and operational SCADA system.
- B. Fiber optic patch cords shall be fiber optic type, with single pair FDDI grade 50/125 μ m multi-mode fibers pre-manufactured with connectors at each end as indicated.
 - 1. Fibers shall be free of surface imperfections and inclusions, and comply with the applicable sections of TIA/EIA - 455, - 472, - 492, - 568A and - 598A.
 - 2. Cables shall have a duplex jacket (zipcord style), color coded buffer, and reinforced yarn for mechanical strength. Cable shall be riser rated, listed as being resistant to the spread of fire, bearing flammability testing ratings as non-conductive optical fiber cable type "OFNR". Multi-mode cable jacket color shall be orange. Single mode cable jacket color shall be yellow.
 - 3. Provide quantity of cables as required for a fully connected and operational SCADA system.
 - 4. Optical characteristics:
 - a. 50/125 μ m multi-mode fibers
 - 1) Gigabit Ethernet capable: 1000 meters @ 850 nm, and 600 meters @ 1300 nm.
 - 2) 10 Gigabit Ethernet capable: 300 meters @ 850 nm, and 300 meters @ 1300 nm.
 - 3) Typical attenuation: 3.0 dB/km @ 850 nm, and 1.0 dB/km @ 1300 nm.
 - 4) Maximum attenuation: 3.0 dB/km @ 850 nm, and 1.0 dB/km @ 1300 nm.
 - 5) Minimum LED bandwidth: 1500 MHz-km @ 850 nm, and 500 MHz-km @ 1300 nm.
 - 6) Minimum LASER bandwidth: 2000 MHz-km @ 850 nm, and 500 MHz-km @ 1300 nm.

2.05. COPPER CABLE TERMINATION HARDWARE

- A. All patch panels, 110 blocks, clips, cable management, etc. shall be of the same manufacturer, Amp, Hubbell, Leviton, OCC, or Systimax, and specifically designed for use together.

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2.06. CABLE SUPPORTS

- A. Supports for cables run “open” above ceilings and the like shall be wide base type J-hook assemblies. Supports shall be made of galvanized steel and have minimum 2” diameter.
- B. Supports for large bundles of cables (more than 50 cables) run open above ceilings, in crawlspace and the like shall be wide base fabric loop, re-enterable assemblies, Erico Caddy CAT425, or approved equal.
- C. Supports for attachment to drop wires shall be capable of minimum 25 lb load capacity.
- D. Supports for attachment to T-bar grid will not be allowed.
- E. Bundle cables with double sided Velcro straps. Tie-wraps shall not be allowed.
- F. Support spacing shall not exceed 5 feet.

2.07. PULL STRING AND ROPE

- A. Pull string shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.
- B. Pull rope shall be twisted polypropylene treated with ultraviolet stabilizers, minimum $\frac{1}{4}$ inch diameter. Rope shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.

2.08. NAMEPLATES AND LABELS

- A. Provide identification tags with labels for the following:
 - 1. Backbone cables, on both ends and at each pathway junction point (e.g. entrance/exit of conduits or raceways), and at 100 foot intervals in open cable tray systems. Labels shall identify the cable type, function, origin and destination.
- B. Provide labels for the following:
 - 1. Backbone cables, on both ends and at each pathway junction point (e.g. entrance/exit of conduits or raceways), and at 100 ft. intervals in open cable tray systems. Labels shall identify the cable type, function, origin and destination.
 - 2. Data station cables, at both ends, with the cable ID code.
 - 3. Data cable termination hardware, with the cable ID codes.
- C. Nameplates, labels, identification tags, etc. shall utilize identifier formats consistent with the ANSI/TIA/EIA 606-A standard. Submit proposed inscriptions to Owner for approval prior to construction.
- D. Font size, color and contrast for all labels shall be in accordance with the ANSI/TIA/EIA 606-A standard.

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- E. All labels shall be neatly typed or generated with a mechanical labeling device.
- F. All labels shall be long lasting and durable, resistant to heat, moisture, solvents, oil, etc.
- G. Cable ID code, labeling scheme, etc. will be provided to the Contractor by the Owner and Engineer. Submit a sample of the proposed labels to Owner for approval prior to installation.

PART 3 - EXECUTION

3.01. COORDINATION OF THE WORK

- A. Where work may affect the owner's standards or operations, coordinate the work of this Section with Owner's Telecommunications Department.
 - 1. Meet jointly with the Owner's representative and representatives of the Telecommunications Department to exchange information and agree on schedules, and details of equipment arrangements and installation interfaces.
 - 2. Record the agreements reached in these meetings and distribute the records to all participants.
 - 3. Schedule the work to avoid unreasonable disturbance or interruption of University operations.
 - 4. Adjust the arrangements and locations of equipment and cabling supports in affected rooms and spaces to accommodate and optimize the room or space arrangements.
- B. Schedule the work to avoid disturbance or interruption of Owner's operations in adjacent spaces and access pathways.
- C. Coordinate work schedule to facilitate installation of active electronic equipment and cut-over of services.

3.02. INTERRUPTIONS

- A. Telecommunications interruptions, whether to individual equipment or to the entire system, shall not be done without prior approval and scheduling with the Owner. Telecommunications interruptions that affect operation of the existing facility shall not be done during normal working hours. Some working of non-standard hours will be required, without increase in Contract Sum.
- B. Reconnection of individual items shall be done 1 at a time.
- C. As much as possible, cables and equipment shall be pre-assembled, systems prefabricated and cable pre-installed to minimize the change-over down time.

3.03. WIRES AND CABLES

- A. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label, is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which

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would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.

- B. All exposed power limited telecommunications cable shall be run in metal raceways, except where specifically approved otherwise.
- C. All cable shall be enclosed in a raceway system.
- D. Cable shall be unrolled from reels, or removed from cartons, and installed in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation.
- E. Slack cable shall be provided at both ends of the cable and at all major pull points to accommodate future changes to the cabling system. A minimum 10 feet shall be provided in the telecommunications room, coiled above the cable rack. A minimum 12 inches shall be provided at the outlet locations, coiled in the accessible ceiling space, where available, or in the surface mounted raceway system.
- F. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before pulling any cable.
- G. Telecommunications cable shall be installed without sharp bends (less than 2 inch radius) or pulling tension in excess of 20 pounds.
- H. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- I. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

- J. In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. Adhere to manufacturers recommended minimum bend radius and maximum pull tension for cables; except, not less than 2 inch bending radius and pulling tension in excess of 20 pounds.
- K. Cable lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue. (Ideal Yellow 77 is not approved.) Recommended Products:
 - 1. Twisted-pair cable: Dyna-Blue, American Polywater
 - 2. Optical fiber cable: Optic-Lube, Ideal

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- L. Replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, and over tightened bindings.

3.04. PULL STRINGS AND ROPES

- A. Provide pull ropes in all below grade telecommunications conduit and duct (with or without cables).
- B. Provide pull string in all above grade telecommunications conduits (with or without cables), except pull strings shall not be permitted in plenum ceiling spaces.

3.05. CABLING CONFIGURATION

- A. Cable installation in the telecommunications closets shall conform to the requirements of the TIA/EIA Standards and the project documents. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment, access hatches to air filters, switches, electrical outlets, electrical panels and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.
- B. Cable shall be routed as close as possible to the ceiling, floor, or corners to insure that adequate wall or backboard space is available for current and future equipment and for cable terminations. Cables shall not be supported from existing electrical conduit or other equipment. Minimum bend radius shall be observed.
- C. Bundle all similarly routed cables together, and attach by means of support saddles screwed to the backboard, then routed vertically and/or horizontally via "square" corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables. Observe cable bend radius.
- D. Cables shall be bundled together by means of Velcro straps. Do not over tighten Velcro straps on station cables. Tie-wraps shall not be used as a means of support or bundling.

3.06. FIBER OPTIC CABLE TERMINATION

- A. Terminations shall be performed by a manufacturer certified technician for that type of connector and shall be made in a controlled environment.
- B. Fiber cables shall be installed so as to protect the optical fibers and connectors from strain and physical damage. The minimum recommended bending radius shall not be exceeded during cable termination and placement.
- C. The contractor may choose to have the cables assembled off-site, although testing must be completed with the cable in its final installed condition.

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3.07. OUTLETS

- A. Outlet boxes shall be securely attached to walls or structural/framing members with approved anchors and fasteners. Use of adhesive tape for this purpose shall not be permitted.

3.08. TESTING

- A. All testing shall be performed by personnel that are trained and certified in the specific task. The Contractor shall perform end-to-end installation performance tests of the cabling plant. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for fiber optic, and all copper wiring.
- B. The Owner and Engineer shall be notified one week prior to any testing so that the initial testing may be witnessed.
- C. Fiber Optic Cable Testing:
 - 1. The meter(s) used for all testing of optical fibers and fiber optic cables shall be calibrated and traceable to the National Institute of Standards and Technology (NIST).
 - 2. Unless noted otherwise, all testing shall be performed in compliance with and shall meet the requirements of the following standards:
 - a. ANSI/TIA/EIA 526-7-98 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 - b. ANSI/TIA/EIA 526-14-A-98 – Optical Power Loss Measurements of Installed MultiMode Fiber Cable Plant
 - c. TIA/EIA TSB-125 – Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning.
 - d. TIA/EIA TSB-140 – Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 - e. ANSI/TIA/EIA 568-B.1 - Commercial Building Telecommunications Cabling Standard, General Requirements.
 - 3. Conduct OTDR tests of each of the optical fibers (single-mode and multimode) to check for faults, end face quality, and to provide overall length using an appropriate high-resolution OTDR device.
 - a. Test optical fibers on the shipping reel prior to installation.
 - b. Test existing optical fibers prior to extension to new rooms.
 - c. Test installed optical fibers in both directions.

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- d. Test single-mode fibers at 1550 nm.
 - e. Provide end face photographic image for each end face and reference the image to the associated OTDR trace file.
 - f. Tests shall be performed using all appropriate settings recommended by the OTDR manufacturer for pulsewidth, range, resolution, index of refraction, etc.
 - g. Tests shall be performed using an appropriate launch cable as required to achieve valid test results.
 - h. Tests shall provide an accurate measurement of the overall cable length, connector reflection, and shall indicate the location of any anomalies or events along the entire length of the cable.
 - i. Tests shall utilize markers indicating the beginning and end of the fiber strand and shall be set and recorded at the time of testing.
- 4. Conduct Attenuation (power meter) tests of the optical fibers to check for overall insertion loss using an appropriate power meter tester.
 - a. Contractor shall determine the reference power reading using the single jumper method, in accordance with the applicable standards prior to testing.
 - b. Conduct attenuation tests in both directions on the installed single-mode cables (new and existing) at 1310 nm (± 10 nm) and at 1550 nm (± 20 nm).
 - c. Power meter tests shall be recorded in software form, when available, or reported on a spreadsheet form, with the dB loss values for each direction at each wavelength and a bi-directional average.
 - 5. The contractor is responsible for obtaining minimum specified attenuation results and other losses in cable installation, fiber connections and polishing, etc.
 - 6. The contractor shall perform the required testing, submit the test results to the engineer for approval and receive approval prior to connecting services to the cable plant.
- D. After all testing has been completed, the Contractor shall verify functional operation.
 - E. For all tests not meeting criteria as determined by the Owner and Engineer, Contractor shall determine problem(s) and make corrections as required (including replacement of the cable and/or other components if necessary) at Contractor's expense without increase in Contract Sum. After correction(s), Contractor shall repeat tests.

End of Section 27 05 00

SECTION 27 10 00 – PROCESS CONTROL AND INSTR. – CONTROL SYSTEM REQUIREMENTS

- A. Pump control system(s) shall be provided, configured and programmed to function as the control and monitoring of the well system. The control system(s) shall be designed to communicate with the well pump control equipment via Ethernet I/P. The control system shall monitor the status of the well level, well flow, and discharge pressure. The control system will also accept and return information to the SCADA system(s) The control system(s) shall utilize a PLC processor.
- B. Shop Well #2; shall include a level transmitter, connected to the telemetry panels local controller. This local controller shall process and make this information available to the SCADA system.
- C. Pump control system; shall provide local indication on the Telemetry Control Panel via a graphical operator interface and HIM directly connected to a VFD. The operator interface shall provide system status, setpoint modification, and alarm duties.
- D. Water System Automatic Control Description: The control system (PLC) shall be capable of running the well pump in automatic control to deliver water to the WTP for treatment and monitoring the well level for critical shutdown levels. The system will monitor Clearwell level at the WTP and call the pump(s) to fill the Clearwell until the off setpoint is attained. The pumps will be called based on the setpoints configured on the operator interface.
- E. The control system shall monitor the well flow transmitter(s) and display this value on the operator interface. The PLC will be configured to monitor the flow transmitter for high-high flow, high flow, low flow and low-low flow. The high-high and low-low alarms shall be configured as shutdown alarms that will inhibit the pump operation until the alarms are cleared by the user. Each of these will have enable/disable functions and time delays adjustable by the operator interface.
- F. The control system shall monitor the well level transmitter and display this value on the operator interface. The PLC will be configured to monitor the level transmitter for low level and low-low level. The low-low alarm shall be configured as shutdown alarms that will inhibit the pump operation until the alarms are cleared by the user. Each of these will have enable/disable functions and time delays adjustable by the operator interface.
- G. The control system shall monitor the status of the pump's associated controller (VFD) for faults. The control for the VFD shall be integrated into the logic of the PLC as I/O via Ethernet communications. The speed control will be supplied via mA signal from the PLC.
- H. The control system(s) shall monitor and forward the following conditions as alarms to the SCADA system.
 - 1. DC UPS Low Battery.
 - 2. DC UPS Power Fail.
 - 3. Well Pump HOA not in Auto.
 - 4. Well Pump/VFD Fault.
 - 5. Well Pump Control Power Available
 - 6. Building Intrusion.
 - 7. Smoke Detector.

SECTION 27 10 00 – PROCESS CONTROL AND INSTR. – CONTROL SYSTEM REQUIREMENTS

8. High flow rate and Shutdown.
9. Low flow rate and Shutdown.
10. Low well level and Shutdown.
11. Power/Phase Fail.
12. General System Fault.
- I. The control system shall monitor and forward the following conditions as status to the SCADA system.
 1. Well Pump Running, HOA status, Commanded Speed, Current Amps (where available),
 2. Flowrate & Flow Totalized Value (kgal).
 3. Well Level, (ftH₂O) drawdown.
 4. Discharge Pressure(s)
- J. The operator interface shall display the above items as well as the following:
 1. Pump starts, Elapsed Runtime, 6 digits and tenths of hours.
 2. Alarm Banner.
 3. Alarm History with time/date stamp, last 50 events.
 4. Flowrate, Flow Totalizer.
 5. Discharge Pressure(s).
 6. Generator Fuel Level
 7. Pump Status, VFD speed command.
 8. Intrusion Status and Access Passwords.
- K. Intrusion monitoring. Main entry door shall be equipped with a limit switch to detect entry to the building(s) and shall develop and alarm condition if the proper deactivation method is not achieved.

PART 2. PRODUCTS

2.01 GENERAL

- A. Code and Regulatory Compliance: All PCIS work shall conform to or exceed the applicable requirements of the National Electrical Code and UL508A. Conflicts between the requirements of the Contract Documents and any codes or referenced standards or specifications shall be resolved according to the NEC and UL.
- B. Current Technology: All meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise required to match existing equipment.
- C. Hardware Commonality: All instruments which utilize a common measurement principle (for example, pressure transmitters, level transmitters that monitor hydrostatic head) shall be furnished by a single Manufacturer. All panel-mounted instruments shall have matching

SECTION 27 10 00 – PROCESS CONTROL AND INSTR. – CONTROL SYSTEM REQUIREMENTS

style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single Manufacturer.

- D. Loop Accuracy: The accuracy of each instrumentation system or loop shall be determined as a probable maximum error; this shall be the square-root of the sum of the squares of certified accuracy of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of plus and minus 0.5 percent of full scale and a minimum repeatability of plus and minus 0.25 percent of full scale unless otherwise indicated. Instruments that do not conform to or improve upon these criteria are not acceptable.
- E. Instrument and Loop Power: Power requirements and input/output connections for all components shall be verified. Power for transmitted signals shall, in general, originate in and be supplied by the control panel devices. The use of "2-wire" transmitters is required unless otherwise approved by the Owner: use of "4-wire" transmitters shall be minimized. All power supplies shall be mounted within control panels or in the field at the point of application.
- F. Loop Isolators and Converters: Signal isolators shall be furnished as required to ensure adjacent component impedance match where feedback paths may be generated, or to maintain loop integrity during the removal of a loop component. Dropping precision wire-wound resistors shall be installed at all field side terminations in the control panels to ensure loop integrity. Signal conditioners and converters shall be furnished where required to resolve any signal level incompatibilities or provide required functions.
- G. Environmental Suitability: All indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Integral heating, cooling, devices shall be furnished in order to maintain all instrumentation devices 20% within the minimums and maximums of their rated environmental operating ranges. The Contractor shall furnish all power wiring for these devices. Enclosures suitable for the environment shall be furnished. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.
- H. Signal Levels: Analog measurements and control signals shall be as indicated herein, and unless otherwise indicated, shall vary in direct linear proportion to the measured variable. Analog electrical signals outside control panels shall be 4-20 milliamperes DC except as indicated.
- I. Control Panel Power Supplies: All control panels with 24 VDC power supplies shall be furnished with DC UPS modules which are configured in a fault-tolerant manner to prevent interruption of service upon failure and interruption of service necessitated by the replacement of a power supply. The failure of a power supply shall be annunciated at the control panel and repeated to the SCADA System.

2.02 OPERATING CONDITIONS

- A. The PCIS shall be designated and constructed for satisfactory operation and long, low maintenance service under the following conditions:
 - 1. Environment: UL Type / NEMA 4/4X
 - 2. Temperature Range: 32 through 104 degrees F

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3. Thermal Shock: 1-degree F per minute, max.
4. Relative Humidity: 20 through 90 percent, non-condensing

2.03 SPARE PARTS

- A. Spare parts shall be furnished as described below with products that match the components installed. Spare parts shall be supplied in their original sealed packages from the manufacturer. Spare parts shall be stored in a container that is identified with labels describing the contents
 1. Spare fuses: furnish one spare for every 5 installed.
 2. Spare PLC processor: provide one spare processor for each type installed. Where integrated or brick style PLC processors are supplied, one complete PLC with processor is to be supplied.
 3. Spare PLC Power Supplies: provide one spare PLC power supply for each type installed.
 4. Spare PLC I/O Cards: supply one spare PLC I/O card for each installed.
 5. Spare DC power supplies: one spare DC power supply for each type installed.
- B. All spare parts shall be submitted before startup commences, suitably wrapped and identified.

2.04 FACTORY TESTING

- A. The Contractor shall arrange for the Manufacturers of the equipment and fabricators of panels and cabinets supplied under this Section to allow the Engineer and Owner to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems, flow measuring devices, and other pertinent systems and devices. A minimum of ten (10) working days notification shall be provided to the Owner prior to testing.

2.05 PUMP CONTROL PANELS (PCP's).

- A. The Pump Control Panels (PCP's) shall be furnished by the PCIS Integrator in accordance with the drawings and installed by the Contractor in accordance with Division 26.

2.06 MAIN CONTROL PANELS AND TELEMETRY PANELS

- A. The Main Control Panel and Telemetry Panels shall be furnished by the PCIS Integrator in accordance with the drawings and installed by the Contractor in accordance with Section 26.

2.07 UNINTERRUPTIBLE POWER SUPPLY (UPS)

- A. Uninterruptible power supplies (UPS) shall be rated at a minimum of 240 volt-amperes, 24VDC output. Battery backup shall be sized to supply 1 hour of operation under normal load conditions. Uninterruptible power supplies shall be Allen Bradley 1606 performance series.

2.08 OPERATOR INTERFACE / PANELVIEW DISPLAY

- A. Operator Display

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1. The operator display shall be a color touch screen with keypad model and shall include Ethernet communications. The operator display shall have 24VDC power input, Windows CE 6.0 operating system. The display shall be a 10-inch TFT display with a minimum resolution of 800x600. The display shall be an Allen-Bradley PanelView Plus 7 Performance Terminal, 2711P-B10C22D9P. No equals.

2.09 PROGRAMMABLE LOGIC CONTROLLER (PLC) HARDWARE

A. Programmable Logic Controller (PLC)

1. Construction: The PLC central processing unit (CPU) shall be of solid-state design. Chassis wired logic is not acceptable. The controller shall be capable of operating in a hostile industrial environment (i.e., subject to heat, electrical transients, RFI, vibration, etc.) without fans, air conditioning, or electrical filtering (up to 60 degrees C and 95 percent humidity). The PLC shall be furnished with at least 1 integral Ethernet communication port.
2. Components-General: The PLC shall have all of the facilities required to implement the control schemes and database shown and specified in the Contract Documents. The PLC shall have floating and PID controller modulating capability. The CPU shall provide internal fault analysis with a fail-safe mode and a dry contact output for remote location alarm, and a local indicator on the PLC frame in the event of a fault in the PLC.
3. Central Processors: The central processor shall contain all the relays, timers, counters, number storage registers, shift registers, sequencers, arithmetic capability, and comparators necessary to perform the specified control functions. It shall be capable of interfacing sufficient discrete inputs, analog inputs, discrete outputs, and analog outputs to meet the specified requirements plus at least 20 percent excess capacity. The PLC shall be provided to support and implement closed loop floating and PID control which is directly integrated into the PLC control program. The power supply shall contain capacitors to provide for orderly shutdown in the event the incoming power does not meet specifications. If this occurs, the processor will cease operation, forcing all to their defined output state.
4. Memory: The programmable controller memory shall have battery backup. The memory shall be a minimum of 750K of user memory for the PLC. An indicator shall show the status of the batteries and a reference shall be available through the SCADA system to alarm the operator that the batteries should be changed. The controller shall be supplied with an internal battery which shall retain the program during power outages of up to one month.
5. The unit shall be supplied with sufficient memory to implement the specified control functions plus a reserve capacity of 20 percent of the total provided. This reserve capacity shall be totally free from any system use. The memory shall be programmed in a multimode configuration with multiple series or parallel contacts, counters, timers, and arithmetic functions.
6. Controllers: The programmable controller shall be programmed in a simple "ladder diagram" language. It shall be easily reprogrammed with a portable laptop computer.

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7. Manufacturer: The programmable logic controller manufacturer shall be Allen-Bradley.
 - a. The Telemetry Control Panel programmable logic controller shall be Allen-Bradley CompactLogix L30ER series processor. No exceptions.
- B. PLC Power Supply:
 1. The PLC power supply shall be a 24VDC, modular unit in the PLC bus system and be sized to power all modules connected to that bus system and an "average module load" for any empty housing slots plus 10 percent above that total. The PLC Power Supply shall be 1769-PB4.
- C. PLC input/output (I/O) Modules:
 1. All I/O housings and modules shall be suitable for hostile industrial environments. All I/O modules shall be isolated and conform to IEEE Surge Withstand Standards and NEMA Noise Immunity Standards. The I/O shall be 4-20 mA DC for all analog inputs and outputs, and all discrete inputs and outputs shall be 24 VDC. Discrete output will be wired to interposing relay outputs to isolate the outputs from devices. Modules shall be removable without having to disconnect wiring from the module's terminals by means of a swing-arm or plug-in wiring connector.
 2. The PLC shall contain the I/O modules required to provide all of the I/O points (including designated future I/O points). In addition, each PLC and remote I/O location shall contain an installed spare capacity of 20 percent of each type of I/O used at that location. All installed spares provided shall be wired and connected to the field terminal strip.
 3. Discrete Input Modules: Defined as contact closure inputs from devices external to the programmable controller module. Individual inputs shall be optically isolated from low energy common mode transients from users wiring or other I/O Modules. The modules shall have LED's to indicate status of each discrete input. Input signal level shall be 24 VDC. The discrete input module shall have a maximum of 16 points each. Discrete input modules shall be Allen-Bradley model 1769-IQ16.
 4. Discrete Output Modules: Defined as solid state source outputs for ON/OFF operation of devices external to the programmable controller module. The output modules shall be optically isolated from inductively generated, normal mode and low energy, common mode transients. All output modules shall have LED's to indicate status of each output point. Output rating shall be 0.5A at 24 VDC minimum. Discrete output modules shall be Allen-Bradley model 1769-OB16.
 5. Analog Input Modules: Defined as 4 to 20 mA DC signals, where an analog to digital conversion is performed with a minimum of 15-bit precision and the digital result is entered into the processor. The analog to digital conversion shall be updated with each scan of the processor. Analog input modules shall have a minimum of 4 inputs each. Analog input modules shall be source or sink to handle 2-wire or 4-wire transmitters respectively. Analog input modules shall be Allen-Bradley model 1769-IF4I.

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6. Analog Output Modules: Defined as 4 to 20 mA DC output signals where each output circuit performs a digital to analog conversion with each scan of the processor. Each analog output module shall have minimum of 4 isolated output points. Analog output modules shall be Allen-Bradley model 1769-OF4CI, and/or 1769-OF8.

2.010 GRAPHICAL HUMAN MACHINE INTERFACE DISPLAY HARDWARE

- A. The Well Pump VFD shall include a Human Interface Module, for access to VFD status and adjustment of parameters.
 1. Components-General: The HIM shall be of compatible with the specified system. HIM shall communicate via the RS-485 port on the VFD. HIM shall be powered by the VFD from the same source as the RS-485 Communication. HIM shall have monochrome colors with a backlight HIM shall have a keypad for operator input. HIM shall be Allen Bradley 20-HIM-A6 w/20-HIM-B1 bezel.

2.011 NETWORK SWITCHES AND MEDIA CONVERTERS

- A. Network Switches: Switch shall be at a minimum an eight port 10/100BASE-T unit with Uplink capability. Switch shall accept standard UTP cables. Switch shall have indicator lights for port connection, power on, collision, and transmit. Unit shall be fully managed type and will include CIP protocol for communication with PLC. Unit shall be 24VDC powered. Unit shall be Allen-Bradley 1783-LMS8.
- B. Media Converter: Fiber to copper media converters shall be supplied with one standard 10/100/1000 UTP port and one SFP port. Unit shall be supplied with one multimode fiber SFP module sized for the application. Unit shall be 24VDC powered. Unit shall be N-Tron 1002MC series.

2.012 FIELD INSTRUMENTATION

- A. The Instrumentation shall be provided by the PCIS Integrator and installed by the Contractor. The Instrumentation shall be provided as part of a complete and operational system, integral to the Telemetry Panel and other equipment, as shown on the drawings.
- B. LEVEL TRANSMITTERS
 1. Well Level Transmitter:
 - a. Units shall be furnished and installed as shown on the Drawings and according to manufacturer's recommendations and requirements.
 - b. Units shall be two-wire transmitter measuring gauge pressure and transmitting 4-20 mA DC output. Unit shall include cable and vent filter required for application, $\pm 0.10\%$ FS BSL accuracy, fully welded 17.5mm diameter titanium construction, 0.39" Diameter, vented polyurethane cable.
 - c. Units shall be supplied with termination enclosure. The termination enclosure will be rated NEMA 4X and shall include polycarbonate front cover, terminals, and breather bulb assembly filled with dry nitrogen. The terminal enclosure shall be PMC TE-11.
 - d. Manufacturer: submersible transmitter shall be PMC MTM 3213 Series.

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C. FLOW METERS

1. Flowmeters for the water systems shall be electromagnetic flanged mounted type. Insertion, turbine, and transit time flow meters will not be accepted.
2. The electromagnetic flow meter shall consist of a flow sensor based on Faraday's Law of Electromagnetic Induction and microprocessor-based signal converter. The mag meter shall automatically sense and correct for shifting velocity profiles in the pipe by constantly obtaining an area weighted mean velocity.
3. Units shall be furnished and installed as shown on the Drawings and according to manufacturer's recommendations and requirements.
4. The flow sensor shall have the following features (minimum):
 - a. Operating principle: Utilizing Faraday's Law of Electromagnetic Induction, the flow of liquid through the sensor induces an electrical voltage that is proportional to the velocity of the flow.
 - b. Construction: The sensor housing shall be Cl.150, carbon steel, flange ASME B16.5 with protective varnish, Liner material shall be a hard rubber polyurethane. Measurement and grounding electrodes shall be 316SS.
 - c. Installation: A minimum of 5 pipe diameters up stream and 2 pipe diameters downstream are recommended (Consult the factory for any variations). The sensor flow tube shall be installed with the required gasketing and grounding rings to equalize the electrical potential of the fluid.
 - d. Sensor Option: IP68, Type 6P, Fact-potted corrosion protection EN ISO 12944 C5-M/Im1. Sensor/Flow Tube shall be capable of being submerged and shall be filled with potting solution at the factory.
 - e. Cables: Unit shall be supplied with factory assembled coil and signal cables. The coil and signal cables shall be pre-attached by the factory to the flow tube. Unit shall be supplied with enough cable to reach the remote mounted converter housing.
 - f. Grounding: Grounding for the flow tube shall be supplied according to the manufacturer's recommendations and requirements. Provide grounding rings or grounding electrodes with each flow meter as required to maintain the specified accuracy by equalizing the electrical potential of the fluid. Ground rings shall be stainless steel.
5. The signal converter shall have the following features (minimum):
 - a. Enclosure: NEMA 4X enclosure
 - b. Display: LCD, Alphanumeric 5-digit auto-ranging to indicate flow rate, 8-digit totalized flow.
 - c. Power supply: 9-36VDC.
 - d. Outputs: 4-20 mA into 800 ohms max. One pulse output, Isolated, open collector, 24 Vdc, 650 Ω maximum loop resistance.

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6. The electromagnetic flowmeter shall be Endress-Hauser Promag W400 Series or approved equal.

D. PRESSURE SWITCHES

1. Units shall be furnished and installed as shown on the Drawings and according to manufacturer's recommendations and requirements.
2. Units shall be supplied with a single diaphragm sensor utilizing 1 SPDT switch contacts for high-pressure status. Shall be independently adjustable w/internal reference scale. Pressure switch shall be rated for 15A 125/250/480 VAC resistive, 0 to 200 psi, dead band: 0.3 to 2.0 psi, 1/4" NPT.
3. Manufacturer: Pressure Switches shall be United Electric 400 Series.

E. SECURITY & FIRE ALARM

1. Units shall be furnished by PCIS Integrator and installed by the Contractor as shown on the Drawings and in accordance with manufacturer's recommendations and requirements. See Section 28 31 00 Fire Detection and Alarm requirements.
2. Smoke Detectors:
 - a. Units shall be furnished and installed as shown on the Drawings and according to manufacturer's recommendations and requirements.
 - b. Units shall include smoke and heat detection sensors. Unit shall include self-diagnostics including automatic sensitivity testing operating independently of other detectors installed. Unit shall be 24VDC powered and include relay status contacts.
 - c. Manufacturer: smoke detectors shall be System Sensor W4TARB Series or equal.
3. Intrusion Switches:
 - a. Units shall be furnished and installed as shown on the Drawings and according to manufacturer's recommendations and requirements.
 - b. Units shall be die-cast aluminum housing, triple-biased, SPDT switch w/external magnet tamper interlock, pry tamper plate, front faceplate integrated actuation.
 - c. Manufacturer: intrusion switches shall be Sentrol 2800T Series or equal.

F. PRESSURE TRANSMITTERS

1. Units shall be furnished and installed as shown on the Drawings and according to manufacturer's recommendations and requirements.
2. Unit shall be pipe-mounted, with weatherproof/dust-tight housing transmitting a proportional 4-20 mA signal output.
3. Provide an in-line isolation valve for each pressure gauge, transmitter and switch.
4. Provide a test TEE with a plug in the pipe between the isolation valve and the pressure transmitter.

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5. Pressure Transmitters shall be Foxboro IGP10 Series or equal.

G. FLOAT SWITCHES

1. Units shall be furnished by PCIS Integrator and installed by the Contractor as shown on the Drawings and in accordance with manufacturer's recommendations and requirements. See Section 26 for requirements.
2. Building Flood Float/Switch:
 - a. Unit shall be a vertical operating hermetically sealed reed switches that is actuated by internal magnets permanently boded inside the float. The float shall be made of Buna-N and utilize a 316SS stem. electrical rating 25 VA: 1A @ 220 VAC, 22 AWG 18" (45 cm) wire leads, 1/8" male NPT mounting.
 - b. Manufacturer: Unit shall be a Dwyer F7-SB or approved equal.

2.013 VARIABLE FREQUENCY DRIVES

- A. This section specifies AC pulse width modulated (PWM) Variable Frequency Drives (VFD) for operation on 480 Volt, three phase, 60 cycle power.
- B. The VFDs shall be provided by the PCIS Integrator and installed by the Contractor. The VFD's shall be provided as a complete and operational system, integral to the Pump Control Panel and other control panels, as shown on the drawings.
- C. Warranty: The Contractor shall guarantee the VFDs to be free of defects in design, materials and workmanship for a period of one (1) year following the date of startup.
- D. The variable frequency drive (VFD) motor controller shall convert 480 Volt, three-phase, 60 hertz utility power to adjustable voltage (0 - 480 volt) and frequency (0 -60 hertz) three-phase, AC power for motor speed control with a capability of 60:1 speed range. All general options and modifications shall mount within the standard adjustable frequency controller enclosure.
- E. The controller(s) shall be suitable for use with any standard configuration squirrel-cage induction motor(s) having a 1.15 Service Factor, or with existing standard squirrel-cage induction motor(s) with nameplate data as shown on the plans. At any time in the future, it shall be possible to substitute any standard motor (equivalent horsepower, voltage, and RPM) in the field.
- F. The VFD shall be designed and constructed to operate within the following service conditions:
 1. Ambient Temperature Range: -10·C to 40·C
 2. Atmosphere: Non-Condensing relative humidity to 95%
 3. AC Line Voltage Variation: +/-10%
 4. AC Line Frequency Variation: ±3 Hertz
- G. The VFD shall produce an adjustable AC voltage/frequency output. It shall have an output voltage regulator to maintain correct output V/Hz despite incoming voltage variations. The VFD shall have a continuous output current rating of 100% of motor nameplate current. The VFD shall be of the Pulse Width Modulated type and employ a dual full-wave diode

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bridge converter to convert incoming fixed voltage/frequency to a fixed DC voltage. The Pulse Width Modulation strategy shall be of the space vector type implemented in a microprocessor which generates a sine-coded output voltage. The inverter output shall be generated by Insulated Gate Bipolar Transistors (IGBT) which shall be controlled by six identical base driver circuits.

- H. The VFD shall include a remote mounted Human Interface Module (HIM) located in the Pump Control Panel (PCP). The keypad and remote mounted HIM shall be provided which will indicate the following (minimum):
 - 1. Frequency output
 - 2. Voltage output
 - 3. Current output
 - 4. Motor RPM
 - 5. Motor kW
 - 6. Elapsed Time
 - 7. Time stamped fault indication
 - 8. DC bus Volt
 - 9. Faults
 - 10. Parameter settings.
- I. The VFD shall be provided within a NEMA 4X enclosure and all of the components shall be factory mounted and wired within.
- J. A ventilation system shall be provided to maintain the internal VFD enclosure temperature within the operating conditions for the VFD. If a free-standing VFD enclosure is provided, it shall be suitable for mounting on a concrete housekeeping pad. If the VFD enclosure is mounted outdoors or if enclosure is mounted in a hazardous or corrosive environment the VFD enclosure shall be fitted with an air conditioner sized to maintain the internal VFD enclosure temperature within the operating conditions for the VFD.
- K. The VFD shall include the following protective circuits and features:
 - 1. Overload rating of 110% for 60 seconds, and 150% for 3 seconds.
 - 2. Output phase to phase short circuit condition.
 - 3. Total ground fault under any operating condition.
 - 4. High input line voltage
 - 5. Low input line voltage
 - 6. Loss of input or output phase
 - 7. Diagnostic Features
- L. The VFD shall include a microprocessor based digital diagnostic system which shall monitor its own control functions and displays faults and operating conditions. A "FAULT LOG" shall record, store, and display the three (3) most recent fault events. The manufacturer shall provide equipment which meets all of the requirements of these

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specifications, and fit within the space requirements. Installation shall be the responsibility of the Contractor. The Contractor shall install the VFD in accordance with the contract drawings and as recommended by the VFD Manufacturer as outlined in the installation manual. Power and control wiring shall be completed by the Electrical Contractor. The Contractor shall complete all wiring in accordance with the recommendations of the VFD Manufacturer as outlined in the installation manual.

- M. For quality assurance, the controller shall be subject to, but not limited to, the following quality assurance controls, procedures and tests:
 - 1. Each VFD shall be functionally tested under motor load. During this load test the VFD shall be monitored for correct phase, current, voltages and motor speed. Correct current limiting operation shall be verified by simulating a motor overload. Manufacturing test data shall be recorded and stored by the manufacturer at the time of production.
 - 2. Verification of proper factory presets shall be performed on 100% of all parameters to ensure proper microprocessor settings. Verification that the proper factory settings are loaded correctly in the drive shall be done via the drive serial interface port.
- N. Startup by a certified factory representative shall be provided by the System Integrator for each drive. A certified start-up form shall be filled out for each drive with a copy provided to the Engineer, Owner, and a copy kept on file at the Manufacturer. Cost for this startup support shall be included in the VFD bid price. The Engineer shall be notified a minimum one (1) week in advance of the scheduled start-up. A list of all drive parameters and settings for each drive shall be provided to the Owner upon project completion of the startup.
- O. Manufacturer: the VFD's shall be Allen Bradley PowerFlex 753 series no equal

END OF SECTION

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1.01 PRODUCT HANDLING

- A. Shipping Precautions: After completion of shop assembly, factory test, and approval, all equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the job site.
- B. Special Instructions: Special instructions for proper field handling, storage, and installation required by the Manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.
- C. Tagging: Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package.
- D. Storage: Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the Contractor at no additional cost to the Owner. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the Owner. Such tests shall be at no additional cost to the Owner, and if the equipment fails the tests, it shall be replaced at no additional cost to the Owner.

1.02 INSTALLATION

- A. GENERAL
 - 1. All instrumentation, including instrumentation furnished under other Divisions, shall be installed under Division 27 and the manufacturers' instructions.
 - 2. Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the Contractor shall make such changes without additional cost to the Owner.
- B. Conduit, Cables, and Field Wiring
 - 1. All conduit and wiring shall be furnished under Division 26 without delay to the work of Division 27.
 - 2. All 4-20 mA signal circuits, process equipment control wiring, signal wiring to field instruments, PLC input and output wiring and other field wiring and cables shall be furnished under Division 26.

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3. All SCADA and PLC equipment cables, Ethernet cable and communication networks shall be furnished under Division 27.
 4. All terminations and wire identification at PCIS equipment furnished under this or any other Division shall comply with the drawings furnished by the system integrator. Wire identification shall be provided as shown on the approved submittal drawings.
- C. Instrumentation Tie-Downs: All instruments, control panels, and equipment shall be anchored by methods which comply with seismic requirements for seismic zone 3.
- D. Ancillary Devices: The Contract Documents show all necessary conduit and instruments required to make a complete instrumentation system. The Contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements at no additional cost to the Owner. All such additions and all such changes, including the proposed method of installation, shall be submitted to the Owner for approval prior to commencing the work. Such changes shall not be a basis of claims for extra work or delay.
- E. Installation Criteria and Validation: All field-mounted components and assemblies shall be installed and connected according to the requirements below:
1. Installation personnel have been instructed on installation requirements of the Contract Documents.
 2. Technical assistance is available to installation personnel at least by telephone.
 3. Installation personnel have at least one copy of the approved shop drawings and data.
 4. Instrument process sensing lines shall be installed similar to conduit specified under ELECTRICAL RACEWAY SYSTEMS. Individual tubes shall run parallel and near the surfaces from which they are supported. Supports shall be used at intervals of not more than 3 feet of rigid tubing.
 5. Bends shall be formed to uniform radii with the proper tool without deforming or thinning the walls of the tubing. Plastic clips shall be used to hold individual plastic tubes parallel. Ends of tubing shall be square-cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at all panels requiring pipe or tubing entries.
 6. All flexible cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.
 7. All connectors shall be, as a minimum, watertight.
 8. All wires shall be mounted clearly with an identification tag that is of a permanent nature.
 9. All wire and cable shall be arranged in a neat manner and securely supported in cable groups and connected from terminal without splices unless specifically approved by the Owner. All wiring shall be protected from sharp edges and corners.
 10. All mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.

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11. Verify the correctness of each installation, including polarity of electric power and signal connections, and making sure all process connections are free of leaks. The Contractor shall certify in writing that for each loop or system checked out, all discrepancies have been corrected.
12. The Owner will not be responsible for any additional cost of rework attributable to actions of the Contractor or the System Integrator.

1.03 CALIBRATION

- A. General: All devices provided under Division 27 shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.
- B. Calibration Points: Each instrument shall be calibrated at 0, 50 and 100% of span using test instruments to simulate inputs. The test instruments shall be in calibration and have accuracy's traceable to National Institute of Testing Standards. Test instruments shall be at least two (2) times more accurate than the instrument being calibrated.
- C. Bench Calibration: Instruments which have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the Owner.
- D. Field Calibration: Instruments which were not bench-calibrated shall be calibrated in the field to insure proper operation in accordance with the instrument loop diagrams or specification data sheets.
- E. Calibration Sheets: Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit:
 1. Project name
 2. Loop number and description
 3. Manufacturer
 4. Model number
 5. Serial number
 6. Calibration range
 7. Calibration data: Input, output, and error at 10 percent, 50 percent and 90 percent of span
 8. Switch setting, contact action, and dead band for discrete elements
 9. Space for comments
 10. Space for sign-off by System Integrator and date
 11. Test equipment used and associated serial numbers

1.04 STARTUP & LOOP TESTING

- A. General: The Contractor shall notify the Owner of scheduled tests a minimum of 5 days prior to the estimated completion date of installation and wiring of the PCIS. After the Engineer's review of the submitted loop diagrams for correctness and compliance with the specifications, loop testing shall proceed. The loop check shall be witnessed by the Owner.

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- B. Interlocks: All hardware and software interlocks between the instrumentation and the motor control circuits, control circuits of variable-speed controllers and packaged equipment controls shall be checked to the maximum extent possible.
- C. Instrument and Instrument Component Validation: Each instrument shall be field tested, inspected, and adjusted to its indicated performance requirement in accordance its Manufacturer's and adjusted to its indicated performance requirement in accordance its Manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirement, or, in the absence of a Contract requirement, any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Owner at no additional cost to the Owner.
- D. Loop Validation: Controllers and electronic function modules shall be field tested and exercised to demonstrate correct operation. All control loops shall be checked under simulated operating conditions by impressing input signals at the primary control elements and observing appropriate responses of the respective control and monitoring elements, final control elements, and the graphic displays associated with the SCADA. Actual signals shall be used wherever available. Following any necessary corrections, the loops shall be re-tested. Specified accuracy tolerances for each analog network are defined as the root-mean-square-summation of individual component accuracy requirements. Individual component accuracy requirements shall be as indicated by Contract requirements or by published manufacturer accuracy specifications, whenever Contract accuracy requirements are not indicated. Each analog network shall be tested by applying simulated analog or discrete inputs to the first element of an analog network. For networks which incorporate analog elements, simulated sensor inputs corresponding to 0, 50 and 100% of span shall be applied, and the resulting element outputs monitored by verify compliance to calculated root-mean-square-summation accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation and setting of discrete devices. Provisional settings shall be made on controllers and alarms during analog loop tests. All analog loop test data shall be recorded on test forms attached at the end of this section which include calculated root-mean-square-summation system accuracy tolerance requirements for each output.
- E. Loop Validation Sheets: The Contractor shall prepare loop validation sheets for each loop covering each active instrumentation and control device except simple hand switches and lights. Loop confirmation sheets shall form the basis for operational tests and documentation. Each loop confirmation sheet shall cite the following information and shall provide spaces for sign-off on individual items and on the complete loop by the System Integrator:
 - 1. Project name
 - 2. Loop number and description
 - 3. Tag number, description, manufacturer and model number for each element
 - 4. Specification sheet number
 - 5. Loop description number
 - 6. Adjustment check
 - 7. Space for comments

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8. Space for loop sign-off by System Integrator and date
9. Space for Engineer witness signature and date
- F. Loop Certifications: When installation tests have been successfully completed for all individual instruments and all separate analog control networks, a certified copy of all test forms signed by the Owner or the Owner's representative as a witness, with test data entered, shall be submitted to the Engineer together with a clear and unequivocal statement that all instrumentation has been successfully calibrated, inspected, and tested.

1.05 TRAINING

- A. General: The Contractor shall train the Owner's personnel on the operation and maintenance of all instruments provided under this Contract. Other requirements for specific equipment may be listed in the individual equipment Specification Sections.
- B. Instructions: The training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.
- C. Duration: Each training class shall be a minimum of 1 hour in duration and shall cover, as a minimum, operational, maintenance, trouble shooting, and repair of the instrument.
- D. Schedule: Training shall be performed during the startup phase of the project. The training sessions shall be scheduled a minimum of 2 weeks in advance of when the courses are to be initiated. The Owner will review the course outline for suitability and provide comments that shall be incorporated.
- E. Agenda: The training shall include operation and maintenance procedures, troubleshooting with necessary test equipment, and changing set points, and calibration for that specific piece of equipment.

1.06 ACCEPTANCE

- A. For the purpose of this Section, the following conditions shall be fulfilled before the work is considered substantially complete:
 1. All submittals have been completed and approved
 2. The PCIS has been calibrated, loop tested and commissioned
 3. The Owner training has been performed.
 4. All required spare parts and expendable supplies have been delivered to the Owner
 5. The performance test has been successfully completed.
 6. All punch-list items have been corrected.
 7. All record drawings in both hard copy and electronic format have been submitted.
 8. Revisions to the Owner's Manuals that may have resulted from the field tests have been made and reviewed.
 9. All debris associated with installation of instrumentation has been removed.
 10. All probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.

1.07 MEASUREMENT AND PAYMENT

SECTION 27 40 00 – PROCESS CONTROL AND INSTR. – EXECUTION

- A. No specific unit of measurement will apply to the Lump Sum Bid Item of “Process Control and Instrumentation”. The Lump Sum Bid Price shall include all labor, testing, materials, equipment, process integration, O&M Manuals, training and other incidental items required for a complete working control system as shown on the drawings and in the contract documents.

END OF SECTION

SECTION 31 10 00 – SITE CLEARING

PART 1. GENERAL

1.01 DESCRIPTION

- A. Work under this Section includes providing all labor, materials, tools, and equipment necessary for clearing, grubbing, removing and disposing of all vegetation and debris. Prior to the start of clearing and grubbing, the Owner shall clearly mark the clearing limits in the field.

1.02 RELATED SECTIONS

- A. Demolition: Section 02 41 00.

PART 2. PRODUCTS (NOT USED)

PART 3. EXECUTION

3.01 CLEARING AND GRUBBING

- A. The Contractor shall clear the entire area within the project limits by clearing and grubbing all vegetation to a minimum of 6-inches below the graded surface.
- B. Contractor shall exercise care as to not encroach or disturb vegetation outside of the marked clearing limits.
- C. Vegetation and debris must be hauled to a legal waste site obtained by the Contractor. All costs associated with disposing of grubbed vegetation and debris shall be incidental to the contract.

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

SECTION 31 20 00 - EARTHWORK

PART 1. GENERAL

1.01 DESCRIPTION

- A. Description of Work: The work covered by this section consists of excavating, hauling and disposal of excavated material, backfilling, placing, compacting and final site grading as specified herein and as shown on the drawings.
- B. Related Documents:
 - 1. Part 4: February 5, 2019 Geotechnical Engineering Letter-Report, Associated Earth Sciences, Inc. This report summarizes the geotechnical site exploration and design recommendations for the proposed wellhouse building and associated improvements.

1.02 SUBMITTALS

- A. Submit, in accordance with requirements of Section 01 33 00 – Submittal Procedures, the following:
 - 1. Gradation and moisture density curves for all imported materials.
 - 2. Proposed compacting equipment for compacting earth embankments.

1.03 QUALITY ASSURANCE

- A. All field inspections and tests will be conducted by an independent testing lab/agency hired by the Engineer. Contractor is to coordinate and schedule inspections with the Engineer. The Engineer will pay the testing lab/agency. In addition, additional QA/QC testing may be performed by the Owner/Engineer's independent testing lab/agency as desired by the Owner/Engineer. The Contractor shall allow the Owner/Engineer's representative to perform additional QA/QC testing and shall make right to the satisfaction of the Engineer all work found to be deficient in meeting the specifications. If the subgrade or fills which have been placed are below the specified density, additional compaction and testing will be required until satisfactory results are obtained. QA/QC testing and inspection by the Owner/Engineer does not relieve the Contractor from the responsibility to provide all adequate quality control measures and all testing to ensure the quality of his own work.
- B. The Engineer will use an independent soils testing lab to measure ASTM D-1557 Methods A through D dry density. Additional tests will be performed as directed by the Engineer in the field. All material samples will be taken at the time and location as agreed by the Engineer and Contractor. The Contractor shall give the Engineer ample time to perform additional QA/QC testing (if desired) of Contractor stockpiled onsite soil tested – at least 5 working days prior to installation of any embankment or backfill using onsite soils.
- C. The Engineer will use an independent soils testing lab and will perform one in place density measurement per every 100 LF of roadway and per every 1,000 square feet of native subgrade prepared and compacted prior to placement of structural backfill materials. The Engineer will perform one in place density measurement per every 500 cubic yards of structural backfill materials placed. The Engineer may increase the frequency if the properties of the soils being placed change or the equipment or procedures used by the Contractor for compacting the soil change. In place density will be measured using ASTM D-1556 or ASTM D2922 and D3017 (nuclear density) test methods. The Contractor shall give the Owner/Engineer ample time to perform additional QA/QC testing (if desired) of the subgrade – at least 24 hours advance notice and a minimum of 4 hours for completion

of testing after compaction is completed on 100 LF of roadway or 1,000 square feet of native subgrade. The Contractor shall give the Owner/Engineer ample time to perform additional QA/QC structural fill testing (if desired) – at least 24 hours advance notice and a minimum of 4 hours for completion of testing after compaction is completed on a lift.

- D. The Contractor shall pay for any additional testing deemed necessary to provide quality assurance for the work or to corroborate or protest the Owner's test results.

1.04 JOB CONDITIONS

- A. Existing Conditions:

The Contractor shall examine the site before commencing work and shall make his own deductions and conclusions as to the nature of materials to be encountered and difficulties anticipated.

1. Data results of a subsurface investigation of the site and soil conditions are included in the Geotechnical Engineering Report (PART 4 – Reference Documents). In addition, the Contractor is encouraged to visually inspect soil conditions at the site.
2. The Contractor is encouraged to visually inspect soil conditions at the site. Contractors shall make whatever investigations as are necessary to determine what measures are necessary to successfully complete the work in accordance with the Contract. The Contractor shall include in the Contract price all work necessary to perform the tasks required to complete the Work as indicated on the Plans and specified herein: including, but not limited to, sheeting, shoring, dewatering, stabilizing slopes, and any other work of temporary nature not a part of the permanent finished structure, lines, and grade.

- B. Subsurface Conditions

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

Groundwater may be encountered, and dewatering measures may be required for construction activities. Contractor is responsible for any dewatering considered incidental to the project. Contractor to plan accordingly.

Boulders, buried or otherwise, may be found in the project area, and boulder excavation is considered incidental, if needed.

1.05 UNSUITABLE FILL MATERIAL

- A. Unsuitable materials shall be those defined as containing volcanic ash, topsoil, vegetation matter, sludge, peat, organic clays and silts, sod, mulch, rubbish, and materials which are excessively fine or moist not allowing adequate compaction

PART 2. PRODUCTS

2.01 GEOTEXTILES

- A. NON-WOVEN GEOTEXTILE WRAP: TenCate Mirafi 160N or equal.

2.02 STRUCTURAL FILL

- A. See Processed Structural Fill Material Section 2.03. All import fill is to be imported material per WSDOT specifications or as specified. Contractor to submit proposed aggregate materials information from local supplier(s) prior to construction.

- B. Excavated soils shall not be used unless the contractor can demonstrate that the soils meet the WSDOT specification and gradation requirements indicated for the material specified. All excavated materials not used shall be hauled to a waste site.

2.03 PROCESSED STRUCTURAL FILL MATERIAL

- A. CRUSHED SURFACING TOP/BASE COURSE. Per WSDOT 9-03.9(3).
1. Shall be used as indicated in the plans and specs and compacted to 95% MDD.
- B. GRAVEL BASE. Per WSDOT 9-03.10.
1. Shall be used as indicated in the plans and specs and compacted to 95% MDD. When used as pavement section gravel base shall have at least 30 percent retained on the U.S. No. 4 sieve.
- C. QUARRY SPALLS. Per WSDOT 9-13.1(5). Unless otherwise noted on the plans.
- D. GRAVEL BACKFILL FOR PIPE ZONE BEDDING. Per WSDOT 9-03.12(3).
- E. GRAVEL BACKFILL FOR DRAINS. Per WSDOT 9-03.12(4).
- F. SAND. Per WSDOT 9-03.13
- G. CAPILLARY BREAK. Per WSDOT 9-03.1(4)C – AASHTO Grading No. 67
1. Shall be used as indicated in the plans and specs and compacted to 95% MDD.
- H. GRAVEL BORROW. Per WSDOT 9-03.14(1)
1. Shall consist of clean, non-plastic, free-draining sand and gravel free from organic matter, with the exception that the percent passing the U.S. No. 200 Sieve shall not exceed 5% and all materials shall be smaller than 4". The percentage passing the No. 200 sieve should be based on that fraction passing the 3/4" sieve. The gradation is summarized below.

Material shall meet the following gradation specifications:

Sieve Size	Percent Passing by Weight
4" Square	100%
2" Square	75-100%
U.S. No. 4	50-80%
U.S. No. 40	30 max.
U.S. No. 200	5% max.
Sand Equivalent	50 minimum

2. Alternatively, crushed surfacing base course, in conformance with Section 9-03.9(3) of the WSDOT Standard Specifications may be used.
- I. GRAVEL BORROW FOR STRUCTURAL EARTH WALL. Per 9-03.14(4) – Geosynthetic Reinforcement. – Shall be used as Slope Stabilization Fill where indicated in the plans and specifications.
- J. GRAVEL BACKFILL FOR WALLS. Per 9-03.12(2).
- K. BANK RUN GRAVEL FOR TRENCH BACKFILL. Per 9-03.19.

PART 3. EXECUTION

3.01 GENERAL

- A. Weather Limitations: Construction shall progress only when weather conditions will not adversely affect the quality of the finished work. Soils that are not compactable due to saturation shall be aerated or removed and replaced with a compactable material. Contractor shall bear all costs for rework caused by weather conditions.
- B. Control of Water: See Section 31 23 19 – Dewatering.
- C. Water for Compaction: Contractor shall provide all water as necessary to moisture-condition Structural Fill material to achieve required compaction densities.
- D. Excavation for Structures: Conform to elevations and dimensions shown with a tolerance of plus or minus 0.10 feet and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services and other construction.

In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade prior to placement of concrete reinforcement. Trim bottoms to required lines and grade to provide solid base for structure.

Crushed Surfacing Base Course shall be placed under all concrete slabs, footings, and foundations, including pile foundations, to the minimum depth indicated below, unless otherwise indicated, on exposed, undisturbed, compacted subgrade immediately upon completion of excavation, or greater thickness if needed to protect subgrade and support contractor selected construction equipment.

For Mat Foundations and Vaults – 12 inches minimum depth

For Shallow Foundations – 18 inches minimum depth

- E. Disposal of Excavated Materials: The Contractor is responsible for ultimate disposal of all excavated material and such disposal shall be incidental to other work. See grading and erosion control plans.
- F. Over Excavation: Excavation of materials beyond the indicated subgrade elevations shall be backfilled with Structural Fill and compacted to provide a firm and stable base at the desired elevation. Work required to remedy over excavation not authorized by the Owner or the Engineer shall be at the Contractor's expense.
- G. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace, as required, to prevent cave-ins. Remove prior to backfilling unless otherwise specified.
- H. Stockpile excavated materials classified as suitable material where directed, until tested and approved for fill. Place, grade, and shape stockpiles for proper drainage and erosion control as approved by the Owner. The temporary stockpile site, if required, shall be coordinated with the Owner.
- I. The Contractor's bid price shall include all costs associated with providing materials and methods for the geogrid-reinforcement where specified, if any.

3.02 SITE PREPARATION

- A. Prior to placement of Structural Fill under buildings, structures, and roadways embankments, scarify, moisture-condition, and compact subgrade soils to at least 95% of the maximum dry density (MDD) based on ASTM D-1557 if not already at 95% of the

MDD. Subgrade preparation per WSDOT Standard Specification section 2-06.

- B. Benching subgrade. Slopes to be filled, which are 5:1 or steeper, shall be benched before receiving structural fill. Each bench shall be level in all horizontal directions and shall be at least 8 feet wide (perpendicular to slope contours).

3.03 STRUCTURAL FILL

- A. Structural Fill shall be placed in lifts not exceeding 10-inches in loose thickness before compaction, unless used as Backfill of Structures, Section 3.04. Structural Fill shall be compacted to 95% maximum dry density (MDD) based on ASTM D-1557.
- B. Where material must be moisture-conditioned before compaction, uniformly apply water to surface of subgrade or to layer of material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry soil that is too wet to permit compaction to required density. Material that has been removed due to excessive moisture may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to satisfactory value.
- C. Maintain Structural Fill areas as a continuous working surface throughout the project. Fill surfaces are to be graded smooth and sealed or covered as appropriate at the end of each work day to prevent unacceptable wetting. After periods of rain, remove any soft material prior to placement of additional fill.
- D. Provide cut and fill slopes reasonably true to line and grade with a tolerance of plus or minus 3 inches.

3.04 GRADING

- A. General. Uniformly grade areas within limits of project site including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where finish elevations are shown or between points where finish elevations are shown or between such points and existing grades.
- B. Drainage Ditches. If any existing drainage ditches or swales exist, they should be maintained and/or fully restored to pre-construction conditions if altered in any way during construction, unless otherwise noted on the plans.

3.05 UNSUITABLE MATERIAL (OVER-EXCAVATION)

- A. In the event that during excavation unsuitable material is encountered at the subgrade, the Owner/Engineer shall be notified of such areas prior placing structural fill or pouring concrete. The specific areas of unsuitable material shall be addressed as described herein. Work under this item shall be allowed ONLY upon written authorization of the Owner or Engineer.
- B. Unsuitable material shall be over-excavated 18-inches below the trench neat line and filled with Crushed Surfacing Base Course conforming to WSDOT 9-03.9(3), or locally available approved equal submitted to and reviewed by the Engineer, and compacted to 95 percent of maximum dry density described in ASTM D1557. Fill up to the trench neat line to allow room for the bedding material.

3.06 DISPOSAL OF UNSUITABLE MATERIAL (OVER-EXCAVATION)

- A. Excavated unsuitable material shall be disposed of offsite.
- B. All material which is hauled off of job site shall be documented with receipts, documenting weight (or volume agreed upon with Engineer for truck counts) and certification that it was

transferred to a legal fill site. Receipts to be provided to Owner.

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

SECTION 31 23 33 – TRENCHING AND BACKFILL

PART 1. GENERAL

1.01 SECTION INCLUDES

- A. This section specifies trench excavation, bedding, backfilling, and compacting for utilities and related facilities.

1.02 RELATED SECTIONS

- A. Section 00 33 00 – Submittal Procedures
- B. Section 01 41 00 – Regulatory Requirements
- C. Section 01 45 00 – Quality Control
- D. Section 31 20 00 - Earthwork
- E. Section 31 32 11 – Soil Surface Erosion Control
- F. Section 33 31 00 – Sanitary Utility Sewerage Piping
- G. Section 33 41 00 – Storm Utility Drainage Piping

1.03 SPECIFIC STANDARDS

- A. The specific reference standard for this work will be Washington State Department of Transportation (WSDOT)/American Public Works Association (APWA) Standard Specifications/for Road, Bridge, and Municipal Construction, latest edition.
- B. Additional standards may also apply.

1.04 QUALITY ASSURANCE

- A. The Contractor shall comply with the requirements of all applicable regulatory agencies having jurisdiction over this work including 29 CFR PART 1926 -- SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.
- B. Material sample and proctor test results shall be provided in advance for any proposed fill material not certified to be compliant with WSDOT Standard Specs.
- C. Use equipment adequate in size, capacity, and numbers to accomplish the work of this section in a timely manner. The Engineer will reject equipment that repeatedly breaks down or fails to produce results within normal tolerances. The Contractor shall have no claim for additional payment or for extension of time due to rejection and replacement of any equipment.

1.05 JOB CONDITIONS

- A. A. The Contractor shall provide protection of existing utilities affected by the work and make every effort to minimize disruptions to all utility services.
- B. If, during the course of construction, it is anticipated that excavation will interrupt traffic or parking areas for longer than 10 to 15 minutes the Contractor must provide advance notice to the Owner. For longer intervals or complete shut-downs, the Owner requires 48 hours advance notice. This advance notice allows time to deliver community notices in advance of the route delays or re-routes. In the event of such road closures, the Contractor shall be solely responsible for all traffic control measures including but not limited to flagging, barricades and cones.

- C. The Contractor shall provide a traffic control plan per WSDOT requirements. Traffic control plan to be submitted for review and acceptance prior to commencing work. See Section 01300 Submittal Procedures.
- D. Trenches shall be closed or covered with steel plates at the end of each work day.

1.06 SUBMITTALS

- A. The Contractor shall furnish the following submittals as part of completing the work associated with this section:
 - 1. Location of disposal sites for excess excavated material.
 - 2. Gradation test results for imported foundation, bedding and backfill material.
 - 3. Proctor tests for proposed imported materials which are not identified as approved for use by WSDOT.
 - 4. Geotextile fabrics cut sheets or WSDOT QPL.

PART 2. PRODUCTS

2.01 TRENCH BACKFILL MATERIAL

- A. Trench Backfill material to be per WSDOT 9-03.19, "Bank Run Gravel for Trench Backfill", and be free from debris and organic matter and other extraneous or objectionable materials. No native backfill to be used.
- B. Excavated soils shall not be used unless the contractor can demonstrate that the soils meet the WSDOT specification and gradation requirements indicated for the material specified.

2.02 BEDDING MATERIAL

- A. Bedding material for utilities shall conform to WSDOT 9-03.12(3), "Gravel Backfill for Pipe Zone Bedding," and be free from debris and organic matter and other extraneous or objectionable materials. No native bedding material to be used.
- B. Pipe bedding material and/or backfill around the pipe shall be placed in layers and tamped around the pipe to obtain complete contact per the project plans.

2.03 UTILITY WARNING TAPE

- A. Shall be APWA color-coded detectable underground marking tape. Tape shall be 6-inch wide plastic-encased aluminum foil tape capable of being located by a metal detector. Message and coding shall be per APWA Standards and shall be as follows:

Message	Color Coding
CAUTION: ELECTRIC LINE BURIED BELOW	Red
CAUTION: WATER LINE BURIED BELOW	Blue
CAUTION: SEWER LINE BURIED BELOW	Green
CAUTION: TELEPHONE LINE BURIED BELOW	Orange
CAUTION: CATV LINE BURIED BELOW	Orange
CAUTION: AIR LINE BURIED BELOW	Light Blue

- B. Provide new continuous warning tape for each type of utility installed. Also provide new

replacement warning tape for utilities encountered and replace any/all damaged sections of existing warning tape for those utilities. Should no warning tape exist on encountered utilities, provide a section of new tape at the crossing.

2.04 DRAIN ROCK & GRAVEL BACKFILL FOR DRAINS

- A. Drain Rock for trench drains and retaining wall drains shall conform to WSDOT 9-03.12(4) Gravel Backfill for Drains.

2.05 COBBLES (3-IN TO 4-IN)

- A. Cobbles for trench drains shall conform to WSDOT 9-03.11(2) Streambed Cobbles (4" Cobbles from table gradation).

2.06 GEOTEXTILE MATERIALS

- A. Drainage Geotextile for use in trench drains and retaining wall drains – Non-woven, moderate survivability, per Table 1 of WSDOT Standard Specification 9-33.2(1).

PART 3. EXECUTION

3.01 EXISTING UTILITIES AND RELATED FACILITIES

- A. Keep active utilities intact and in continuous operation. Regarding existing underground utilities, the Contractor shall:
 - 1. Call the utilities underground location center for field location of utilities.
 - 2. Pot hole as necessary to locate existing utilities.
 - 3. Not begin excavation until all known underground facilities in the vicinity of the proposed excavation have been either referenced on Plans, located, and/or marked on the ground.
- B. Location and dimensions shown on the Plans for existing utilities are in accordance with available information without uncovering, measuring, or other verification. Utilities/facilities whose underground location can be reasonably determined from existing above-ground features shall be considered the same as having been individually marked. In the event the Contractor discovers unknown utilities, he shall:
 - 1. Take reasonable and appropriate steps to avoid damage to the utility and/or Commission property.
 - 2. Promptly notify the Engineer for individual directions.
 - 3. All costs to repair damage to above-ground or known subsurface structures due to operator error will be borne by the Contractor.

3.02 TRENCHING

- A. Trench excavation shall conform with the most recent version of the WSDOT Standard Specifications. Special attention shall be paid to the requirements for trench safety noting that all work shall be performed in strict compliance with 29 CFR 1926.
- B. The Contractor shall be solely responsible for any shoring, cofferdams or trench safety systems employed on the project. In no way shall the Owner or Engineer assume any responsibility for trench safety or the protection of life or property implied by the use of trench safety systems.
- C. The width of excavation for utility trenches shall be in accordance with WSDOT

Standard Specification. No additional payment will be made for extra excavation required due to poor soil conditions.

- D. See Section 02300 Earthwork for excess material disposal requirements.
- E. The Contractor shall provide and operate all material, equipment and labor necessary to keep excavations and earth embankments free from water during construction. Dewatering shall prevent weakening foundations, undercutting trench walls, or otherwise affecting the stability of sub-grades and foundations. The Contractor shall establish and maintain positive drainage away from excavations to prevent surface water from entering excavations. Water shall be disposed of in a manner which prevents injury to public or damage to property.
- F. The Contractor shall backfill or otherwise cover all trenches at the end of each working day to protect public safety. The length of open trench excavation in advance of pipe laying operations shall not exceed 200 feet unless approved by the Owner. In no case shall the length of an open trench or size of an excavation exceed the Contractor's ability to safeguard the public welfare.

3.03 BEDDING

- A. Pipe bedding and pipe zone backfill installation shall comply with the WSDOT Standard Specifications, Section 7-08 — General Pipe Installation Requirements and per the Plans.
- B. Pipe bedding and pipe zone backfill shall be compacted to 90% of the maximum dry density described in ASTM D1557. Pipe bedding and pipe zone backfill shall be compacted in 6-inch maximum lifts.

3.04 BACKFILL

- A. Trench and structure backfilling shall comply with the most recent version of WSDOT Standard Specifications, Section 7-08 — General Pipe Installation Requirements and per the Plans.
- B. Structure backfilling shall comply with the most recent version of WSDOT Standard Specifications, Section 2-09.3(1)E Backfilling and per the Plans.
- C. In areas beneath driveways, sidewalks, or within 5-feet of the roadway template (including shoulder or structures), backfill shall be compacted to 95% of the maximum dry density described in ASTM D1557. Backfill within the roadway template shall be compacted in 6-inch maximum lifts.
- D. In landscaped or native areas outside roadway templates and not beneath pavement, gravel paving, drives or sidewalks, backfill shall be compacted to 90% of the maximum density described above.
- E. Construction shall progress only when weather conditions will not adversely affect the quality of the finished work. At the same time, the Contractor must be prepared to take such measures as are necessary to complete the construction within the specified contract period. Where soils cannot be compacted due to moisture content, material shall be aerated or removed and replaced with a suitable granular backfill material. Contractor shall bear all costs for necessary extra measures and/or rework if excavated material is made unsuitable by adverse weather conditions and not protected by contractor in accordance with WSDOT Standard Specifications covering contractor requirements for protection of excavated materials.

3.05 UNSUITABLE TRENCH OVEREXCAVATION

- A. In the event that during trenching unsuitable material is encountered at the trench bottom, the Owner shall be notified of such areas prior to placing pipe. The specific areas of unsuitable material shall be addressed as described herein. Work under this item shall be allowed ONLY upon written authorization of the Owner.
- B. Unsuitable material shall be overexcavated 18-inches below the trench neat line and filled with Crushed Surfacing Base Course conforming to WSDOT 9-03.9(3), or locally available approved equal submitted to and reviewed by the Engineer, and compacted to 95 percent of maximum dry density described in ASTM D1557. Fill up to the trench neat line to allow room for the bedding material.

3.06 COMPACTING

- A. Compaction shall be performed in accordance with Section 31 20 00 Earthwork or as detailed on the Contract Plans.

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

SECTION 31 32 11 - SOIL SURFACE EROSION CONTROL

PART 1. GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to following:
 - 1. Temporary measures to prevent soil erosion and sedimentation of storm sewers, streams or other bodies of water.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
 - 1. Section 31 23 33 Trenching and Backfill
 - 2. Section 32 92 19 Seeding

1.03 REFERENCES

- A. WSDOT Standard Specifications for Road, Bridge and Municipal Construction, latest edition.
- B. Washington State Department of Ecology's August 2012 Edition of the Stormwater Management Manual for Western Washington, as amended in 2014.

1.04 SUBMITTALS

- A. Submit in accordance with Sections 01 33 00 and the following
 - 1. Geotextile for temporary silt fence.
 - 2. Compost for compost berm.
 - 3. Inlet protection products.
 - 4. Barrier fence.
 - 5. Track clean plates.
 - 6. Any other erosion control products proposed for use on the site.

1.05 QUALITY ASSURANCE

- A. Installer shall be a Specialist.
- B. Regulatory Requirements: Section 01 41 00.

PART 2. PRODUCTS

2.01 MATERIALS

- A. Silt Fence. Silt Fence shall comply with WSDOT Standard Specification 9-33 – Construction Geotextile and meet the properties described in Table 6 of said specification.
- B. Quarry Spalls per Earthwork Spec.
- C. Straw Mulch. Per WSDOT 9-14.4(1) – Straw
- D. Compost. Compost shall be in accordance with WSDOT Standard Specification 9-

14.4(8).

- E. Inlet Protection Insert. Inlet protection insert shall be in accordance with City of Bellingham Standard Detail EC-620 – Catch Basin Insert.
- F. Orange Barrier Fence. Orange barrier fence shall comply with WSDOT Standard Specification 9-14.5(8) – High Visibility Fencing.
- G. Track Clean Plates. Track clean plates shall be Track Clean™ Construction Entrance Plates or approved equal. Plates must adhere to the guidelines of BMP C105: Stabilized Construction Entrance, found in Volume II of the WA State Ecology Stormwater Management Manual of Western Washington.

PART 3. EXECUTION

3.01 PREPARATION

- A. Planning Of Construction: Plan and coordinate to reduce sediment pollution. Install all site BMPs prior to the commencement of land disturbing activities. Minimize the area of disturbance. Keep the area of clearing and grubbing to the minimum necessary for construction.

3.02 INSTALLATION

- A. Install in accordance with “Quality Assurance” provisions, “References,” and Specifications. Where these may be in conflict, the more stringent requirements govern.
- B. Pump Water. Practice sound pump water management to reduce sediment production. Discharge pump water into stabilized surfaces and allow to filter through existing vegetation. Repair discharge areas, upon completion of construction, to pre-existing conditions or better. Do not pump water into adjacent wetlands, creeks, or rivers.
- C. Stabilization. Stabilize all slopes, channels, ditches or any disturbed area as soon as possible after the final grade or final earthmoving has been completed. Upon completion of the project, stabilize all areas which were disturbed by the project to prevent accelerated erosion. Maintain any erosion and sedimentation control facility required or necessary to protect areas from erosion during the stabilization period.
- D. Earthwork.
 - 1. Control excavation for site work operations. Stockpile the material removed from the excavation in area where a minimum of sediment will be generated and where other damage will not result from the piled earth.
 - 2. Stockpile topsoil separately and redistribute where shown on plans uniformly after grading.
 - 3. Protect all stockpiled soil materials from erosion through the use of plastic sheeting or similar temporary measures, secured against wind disturbance.
 - 4. Any area stripped of vegetation, where no further work is anticipated for a period of 14 calendar days, shall be immediately stabilized with an approved erosion control method such as seeding, mulching, netting, erosion control blankets, etc.
 - 5. All disturbed areas shall be promptly and thoroughly stabilized against erosion during periods of wet weather, particularly when work is not being performed at the site.

3.03 MAINTENANCE AND CLEANING

- A. Maintenance. Maintain the erosion control measures and facilities in proper condition so that they will individually and collectively perform the functions for which they were designed. In order to ensure the effectiveness and proper maintenance of the measures and facilities, the Contractor and Owner shall make periodic inspections at sufficiently frequent intervals to detect any impairments of the structural stability, adequate capacity, or other requisites of the herein approved measures and facilities which might impair their effectiveness. Take immediate steps to correct any such impairment found to exist.
- B. Cleaning: Leave installations clean; premises free from residue of work of this section.
- C. Street Sweeping: If onsite measures fail to prevent soil migration to street, Contractor shall provide regular sweeping.
- D. Inspection, or lack thereof, shall not relieve the contractor of the responsibility of maintaining erosion control at all times. The contractor should, therefore, check all erosion control periodically on their own to ensure adequacy.

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

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF SECTION

- A. This section includes all work related to providing temporary support and protection for excavations to safeguard public health, protect workers, protect existing improvements and insure the safe prosecution of the work. The Contractor may elect to employ any combination of shoring, tunneling, boring, sliding trench shield, or other means to complete the work.
- B. The Contractor shall provide all equipment, material, labor and design services necessary to develop and maintain adequate excavation support and protection. The Contractor shall determine the need for and adequacy of excavation support and protection requirements.
- C. The Contractor shall be solely responsible for any excavation support and protection or trench safety systems employed on the project. In no way shall the Owner assume any responsibility for the protection of life or property implied by the use of such systems.

1.02 RELATED SECTIONS:

- A. Related work specified elsewhere:
 - 1. Section 31 23 33 - Trenching and Backfill

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 Subpart P - Excavations

1.04 LAWS AND REGULATIONS

- A. The Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither the Owner nor Engineer or their staff will be responsible for monitoring Contractor's compliance with Laws and Regulations.
- B. All structure excavation, trenching, and shoring shall be performed in strict compliance with 29 CFR 1926 Subpart P - Excavations as well as all other applicable local, State, Contracting Agency, and Federal laws and regulations."

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

- C. The Contractor is to provide a stamped shoring plan prior to beginning excavation work in areas where required. OSHA standards are to be followed at all times, and minimizing risk is a priority.

1.05 MEASUREMENT AND PAYMENT

- A. The costs for Excavation Support and Protection shall be included in the lump sum price for Trench Safety Systems. No extra payment will be made unless the quantity of trenching changes as direct result of a change in the scope of work by an approved change order.

PART 2 - PRODUCT

This Section Not Applicable.

PART 3 - EXECUTION

3.01 METHODS

- A. The Contractor shall make the determination as to the most effective means for ensuring excavation support and protection. This may include, but is not limited to, the following:
 - 1. The Contractor may dig open pits or perform extra excavation (at no expense to the Owner) without shoring or cofferdams.
 - 2. Use of shoring or cofferdams if in compliance.
 - 3. Specific requirements related to working in trenches shall conform with *WSDOT Standard Specifications*
- B. Any damage to existing or proposed improvements resulting from the Contractor's excavation support and protection system shall be repaired and included as a part of this pay item.

END OF SECTION

SECTION 32 31 00 – CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Work consists of furnishing all labor, materials, and incidentals necessary to erect all security fences (6' chain link fence with barb wire) and gates at the location shown on the drawings. Construction to provide a rigid, taut fence closely conforming to the surface of the ground.
- B. Work included
 - 1. Fabric, line posts, end, corner and pull posts, gate posts, gate frames, top rails, and post braces and accessories.

1.02 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. A 53 Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
 - 2. A 153 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
 - 3. A 392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

1.04 SUBMITTALS

- A. Three samples, approximately 6 inches long, or 6 inches square, of fabric material (standard galvanized), post section and typical accessories.
- B. Submit shop drawings showing fence height, type of fabric, and location and size of posts and gates, including details of post tops, rails, braces, foundations, footings, gate posts, hinges, frames, latches, ties and other accessories.

SECTION 32 31 00 – CHAIN LINK FENCES AND GATES

1.05 QUALIFICATION OF INSTALLER

- A. Installer must be experienced in fence installations and must examine conditions under which fence and gates are to be installed. The Contractor shall notify the Engineer in writing of improper conditions of work, and shall not proceed with work until unsatisfactory conditions have been corrected.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Galvanized steel shall be Class 3.

2.02 FENCES, POSTS, RAILS AND BRACES

- A. All steel tubular members shall comply with provisions of ASTM A 53, Schedule 40, for weight and coating.

2.03 FABRIC

- A. Chain link fabric to conform to ASTM A 392, No. 9 gage wire, 2-inch mesh, Class 3 galvanizing.
- B. Fabric galvanized after weaving.
- C. Fabric knuckled at bottom selvage and twisted and barbed at top.

2.04 LINE POSTS

- A. Posts of galvanized steel.
- B. Posts round in section, with 2.375-inch outside diameter and weighing 3.65 lb/ft.

2.05 END, CORNER PULL POSTS

- A. Posts of galvanized steel.
- B. Posts round in section, with 2.875-inch outside diameter and weighing 5.79 lb/ft.

SECTION 32 31 00 – CHAIN LINK FENCES AND GATES

2.06 GATE POSTS

- A. Posts of galvanized steel.
- B. Gate leaves over 6 feet - 0 inch and up to and including 13 feet - 0 inch wide: 4 inches O.D. Schedule 40 pipe and weighing 9.1 lb/ft.
- C. Gate leaves over 13 feet 0 inch and up to and including 18 feet 0 inch: 6-5/8 inch O.D. Schedule 40 pipe and weighing 18.97 lb/ft.

2.06 GATE FRAMES FOR CHAIN LINK FENCING

- A. Frames of galvanized steel.
- B. Frames round in section, with 1.9-inch outside diameter, and weighing 2.72 lb/ft.
- C. Frames shall have intermediate members and/or diagonal truss rods for gate leaves more than 8 feet wide.
- D. Gate frame joints shall be made by welding or by means of heavy fittings making rigid and watertight connections.

2.07 TOP RAILS AND POST BRACES

- A. Top rails and post braces of galvanized steel.
- B. Top rails and post braces round in section, with 1.66-inch outside diameter, and weighing 2.27 -lb/ft.

2.08 BARBED WIRE

- A. Barbed wire shall be double strand twisted 12-1/2 gauge galvanized with 14 gauge, 4 point barbs spaced on approximately 5-inch centers. Extension arms to accommodate barbed wire shall withstand a 250-pound pulldown load from end of arm.

2.09 ACCESSORIES AND ATTACHMENTS

- A. Stretcher bars: Galvanized steel 3/16 by 3/4-inch in cross section, or equivalent cross section with length equal to full height of fabric.

SECTION 32 31 00 – CHAIN LINK FENCES AND GATES

- B. Truss rods: Galvanized steel, 3/8-inch-diameter, or equivalent cross section, and shall have suitable adjustment.
- C. Post tops: Caps of pressed galvanized steel. Provide with a hole suitable for through-passage of the top rail. Fit snugly to the post, have means for attaching securely to the post and exclude moisture from tabular posts.
- D. Gates swing: Swing type, complete with latches, stops, keepers, hinges, locks and fabric. Fabric to match fence. Hinges of adequate strength to support gate and not twist or turn under action of gate. Latches of plunger bar type and full gate height located in a manner that will engage the gate stop. Forked latches used for single gates less than 10 feet wide. Latches shall provide for locking. Stops shall consist of a flush plate with anchor placed in concrete to engage the plunger bar of the latch. Other approved types of stops may be used for single gates less than 10 feet wide. Keepers shall be substantial devices for securing and supporting the free end of the gate in open position.
- E. Rolling Gates: (not used)
- F. Top rail and bottom rail couplings: Outside sleeve type at least 6 inches long. At least 20% of the couplings shall have an internal heavy spring to take up expansion and contraction.
- G. Brace wire, tie wire, and tension wire:
 - 1. Galvanized wire meeting requirements of ASTM A 12 1, Class 3 coating.
 - 2. Unless otherwise designated, size of wire shall not be smaller than the following:

Tension wire	No. 7
Brace wire	No. 9
Tie wires or clips for fastening field fence to steel posts	No. 12
 - 3. Tie wires for chain-link fence of size and type recommended by manufacturer, but not smaller than No. 9 for post ties or No. 12 for rail and brace ties. Equivalent galvanized steel clips or aluminum wire or clips may be used as accepted by the Engineer.
- H. Galvanizing: All pipe sections galvanized after fabrication shall be in accordance with ASTM A 53. All other items incidental to erection of fence except fabric and wire fabric ties galvanized after fabrication in accordance with ASTM A 153. Wire fabric ties will have not less than 0.8 ounce of zinc per square foot.

SECTION 32 31 00 – CHAIN LINK FENCES AND GATES

2.10 CONCRETE FOOTINGS

- A. Concrete shall be mixed and placed in strict accord with Section 03300.

PART 3 - EXECUTION

3.01 CLEARING AND GRADING

- A. Contractor shall perform such clearing and grading as necessary to construct fence to required alignment and provide a reasonably smooth ground profile at the fence line.

3.02 POST ASSEMBLIES

- A. End, corner, gate, and pull or intermediate anchor posts placed at designated locations.
- B. Posts securely braced and holes filled with concrete. Form not required for post encasement

3.03 HORIZONTAL DEFLECTION

- A. At points of deflection where fence changes alignment by more than 5 degrees provide a post brace and truss rod in each fence panel to the post located at the angle point.
- B. Footings for all posts located at points where the change in alignment exceeds 5 degrees shall be constructed as specified for end posts.

3.04 LINE POSTS

- A. Line posts spaced at not more than 10-foot centers.

3.05 POST BRACES

- A. A brace and truss assembly shall support each gate, corner, pull, or end post for chain link fencing. Brace shall extend to each adjacent line post at mid-height of fabric. Truss shall extend from line post back to gate, corner, pull, or end post.

3.06 FABRIC

- A. Fabric shall not be erected until 5 days after the time of setting the posts in concrete. Fabric shall be fastened to line posts with clips or bands spaced

SECTION 32 31 00 – CHAIN LINK FENCES AND GATES

approximately 12 inches apart and to top rail with bands or tie wires at approximately 24-inch intervals. Pull fabric taut and tie to posts, rails and tension wires. Install fabric on security side of fence and anchor to framework so that fabric remains in tension after pulling force is released.

3.07 TENSION WIRES

- A. Tension wires installed at bottom of fabric before stretching fabric and tied to each post with wire ties or clips.

3.08 ELECTRICAL GROUNDS

- A. Chain-link fence which crosses beneath any primary electrical power transmission line, other than a secondary feeder line for individual customer service, shall be properly grounded. Grounding shall consist of placing one ground rod at point of crossing and one 25 to 50 feet in each direction from the crossing.
 - 1. Chain-link fence erected adjacent to and within 50 feet of a primary power line shall be grounded by placing ground rods at not more than 500-foot intervals.
 - 2. Each applicable straight section of fence shall have at least one ground. Engineer may require installation of an additional ground at terminus of a section of fence or at other locations near areas of pedestrian traffic.
 - 3. Ground rod shall be connected to fence.

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

SECTION 33 05 00 - COMMON WORK RESULTS FOR UTILITIES

PART 1. GENERAL

1.01 SECTION INCLUDES

- A. This section covers information supplementary to the Drawings and the WSDOT Standard Specifications. The Contractor shall furnish and install pipe and fittings as shown on the Drawings, as specified in these Specifications, and as required for a complete and functional installation. All pipe and fittings shall be new.
- B. Piping systems, including pipe, fittings, anchors, and all other elements, shall be detailed, fabricated, and installed to resist all internal and external loads which will be imposed upon them. Pressure ratings and materials stated in these Piping Specification sections are minimum acceptable standards. Systems shall be suitable for the service intended.
- C. The pipe diameters shown on the Drawings and used in these Specifications are inside diameters unless specific reference is made to outside diameter of the pipe or the pipe is a standardized product normally designated by a nominal size, e.g., ductile iron pipe.
- D. The Contractor shall furnish and install pipe and fittings as shown on the Drawings, as specified in these Specifications, and as required for a complete and functional installation. The pipe shall be new, manufactured in accordance with these Specifications and Drawings.
- E. Work includes but is not limited to following:
 - 1. Trenching, unsuitable trench bottom overexcavation, bedding, backfilling, compacting and disposal of excess materials as required for installation of all underground utilities, conduit and other miscellaneous structures.
 - 2. Providing all material, equipment and labor necessary to complete the excavation and backfill operations necessary to install the underground utilities depicted on the plans.
 - 3. Trench dewatering and pumping.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
 - 1. Section 31 23 33 - Trenching and Backfilling
 - 2. Section 33 31 00 – Wastewater Pipe, Fittings and Hoses

1.03 REFERENCES

- A. WSDOT Standard Specifications for Road, Bridge and Municipal Construction, Latest Edition; Sections 2-09 - Structure Excavation, and 7-08 - General Pipe Installation Requirements.
- B. WSDOT Standard Plans for Road Bridge and Municipal Construction, most recent edition.
- C. Washington State Department of Ecology's Latest Edition of the Stormwater Management Manual for Western Washington.

1.04 SUBMITTALS PRIOR TO CONSTRUCTION

- A. Submittals during construction shall be made in accordance with Part 3, Section 01 33 00. In addition, the following specific information shall be provided.
 - 1. Field Fabrication - For pipe lines which are assembled in the field from standard fittings, submit complete data on pipe and fittings, including any manufacturer's installation instructions.
 - 2. Material Certification - Certification of all materials, and manufacturing properly executed by the manufacturer, shall be available to show compliance with the Specification of materials being furnished. Test data on tests performed shall be provided as requested by the Engineer.
 - 3. Existing Pipe Verification - Expose all existing pipes which are to be connected to new pipelines. Verify the size, material, elevation, horizontal location, and pipe service of these existing pipes with sufficient lead time to make accommodations as necessary.

1.05 SYSTEM DESCRIPTION

- A. Provide protection of existing utilities affected by the work and make every effort to minimize disruptions to all utility services.
- B. If, during the course of construction, excavation interrupts traffic for longer than 15 minutes, inform the Owner and make all necessary arrangements for ingress and egress. In the event of such road closures, the Contractor shall be solely responsible for all traffic control measures including but not limited to flagging, barricades and cones.
- C. Trenches shall be closed or covered with steel plates at the end of each work day.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. See referenced Codes, ordinances and the like/Section 01 30 00.
 - 2. Comply with the requirements of all applicable regulatory agencies having jurisdiction over this work including the Washington Industrial Safety and Health Act.

PART 2. PRODUCTS

2.01 BOLTS AND NUTS

- A. Bolts and nuts shall be Type 316 stainless steel.

2.02 RUBBER GASKETS

- A. Store all rubber gaskets in a cool, well-ventilated place, and do not expose to the direct rays of the sun. Do not allow contact with oils, fuels, or petroleum solvents.

2.03 JOINT LUBRICANT

- A. Furnish joint lubricant with the pipe. Furnish the amount and type recommended by the pipe manufacturer. The lubricant shall be a water-soluble, nontoxic, vegetable soap compound conforming to United States Pharmacopoeia No. P39.

2.04 TESTING

- A. Provide all hoses, plugs, and other necessary equipment to complete the tests.

2.05 CONCRETE FOR THRUST BLOCKING, THRUST TIES AND ENCASEMENT

- A. The concrete for all thrust blocking and thrust ties shall develop a minimum compressive strength of 3,000 psi at 28 days.

PART 3. EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Utility Location. Make every effort to identify the location of all existing underground utilities. Contact Utility Locate Service 48-hours in advance of any excavation.

3.03 ELECTRICAL AND WATER SERVICE

- A. Electrical Service. Contractor to protect existing electrical and water services as outlined on the Contract Plans. Coordinate with Puget Sound Energy, the City of Ferndale, and the Engineer at least three business days in advance of any underground work in the vicinity of the existing electrical services.

3.04 TRENCH EXCAVATION AND BACKFILL

- A. Trench Excavation and Backfill.
 - 1. All trench excavation and backfill shall be performed in accordance with Section 31 23 33 – Trenching and Backfill.

3.05 SHIPPING AND HANDLING MATERIALS

- A. During transportation, unloading, and storage, pipe and materials shall be protected, supported, and handled in a manner to prevent damage to the materials, especially linings and coatings. Only implements and equipment suitable for proper and safe handling of the materials shall be used. Fabric slings shall be used to lift pipe and fittings, not chains or cables.

3.06 PIPE PREPARATION AND HANDLING

- A. Each pipe and fitting shall be carefully inspected before the exposed pipe or fitting is installed or the buried pipe or fitting is lowered into the trench. The interior and exterior protective coating shall be inspected, and all damaged areas patched in the field with material similar to the original, except damaged glass-lined pipe. Any damaged glass-lined pipe shall not be used and shall be promptly removed from the site. Any pipe which, in the opinion of the Engineer, is damaged beyond repair shall be removed from the site and replaced with another unit. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after installation.
- B. Use proper implements, tools, and facilities for the safe and proper protection of the pipe. Carefully handle pipe in such a manner as to avoid any physical damage to the pipe. Do not drop or dump pipe from trucks or into trenches under any circumstances.
- C. All pipe fittings and appurtenances shall be installed in accordance with the manufacturer's instructions and these Specifications.

3.07 CUTTING AND FABRICATING

- A. Cut pipe with approved cutters, do not flame cut except for mild steel pipe. Cut perpendicular to axis of pipe. Dress ends to suit type of joint being made, removing burrs, mill scale, and debris before making up. Repair damaged linings and coatings.

3.08 BELL HOLES

- A. Excavate bell holes at each joint to permit proper assembly and visual and feeler gauge inspection of the entire joint.

3.09 EXPANSION PROVISIONS

- A. Provisions shall be made for the expansion and contraction which may occur in pipe due to temperature change. Pipe expansion provisions may not be detailed on the Drawings. The absence of these details on any Drawing shall not relieve the Contractor of the responsibility for providing them where required, and at his sole expense.

3.010 PIPE IN CONCRETE ENCASEMENTS OR CONCRETE BEDDING

- A. Except for welded joints, pipe joints shall not be encased in concrete unless specifically required on the Drawings. Pipe coatings shall be continuous through concrete encasements, thrust blocks, anchors, collars, etc., unless otherwise shown on the Drawings.

3.011 FLEXIBLE JOINTS AT CONCRETE BACKFILL OR ENCASEMENT

- A. Except for welded joint pipe, a flexible joint shall be provided within 18 inches or one-half the pipe diameter, whichever is less, from the terminations of any concrete backfill, or concrete encasement.

3.012 FLEXIBLE JOINTS AT CONCRETE STRUCTURES

- A. A flexible joint shall be provided near the exterior face of all structures. The joint may be flush with the face, may be up to one half pipe diameter away from the face, but shall not be more than 18 inches away from the face.

3.013 LINE AND GRADE

- A. Grade the bottom of the trench by hand, if necessary, to the line and grade to which the pipe is to be laid, with proper allowance for pipe thickness and for base. Remove hard spots that would prevent a uniform thickness of bedding or cause non-uniform pressure on the pipe barrel.
- B. Lay pipe to a uniform grade between indicated elevations. Do not deviate more than 1 inch from line or 1/4 inch from established grade. Measure for grade at the pipe invert.
- C. Before laying each section of pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom with bedding shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

3.014 PERMISSIBLE DEFLECTION AT JOINTS

- A. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, do not exceed the amount of deflection recommended by the pipe or coupling manufacturer.

3.015 LAYING AND JOINTING PIPE AND FITTINGS

- A. After a section of pipe has been lowered into the prepared trench with bedding, clean the end of the pipe to be joined, the inside of the joint, and the rubber ring immediately

before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer. Provide all special tools and appliances required for the jointing assembly.

- B. The gasket position shall be checked with a feeler gauge, furnished by the pipe manufacturer, to assure proper seating. After the joint has been made, check pipe for alignment and grade. Provide sufficient pressure in making the joint to assure that the joint is "home", as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed.
- C. Take the necessary precautions required to prevent excavated or other foreign material from entering the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workmen are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.
- D. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.
- E. When cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer.

3.016 UNSUITABLE CONDITIONS FOR LAYING PIPE

- A. Do not lay pipe in water, or when in the opinion of the Engineer, trench conditions are unsuitable.

3.017 PREVENTING TRENCH WATER FROM ENTERING PIPE

- A. When the pipe laying is not in progress, close the open ends of pipe by approved means, and do not permit trench water or other foreign material to enter the pipe. Keep water out of the trench.

3.018 LOCATION OF THRUST RESTRAINT

- A. All pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist shall be thrust restrained. Thrust blocks and ties are not shown on the Drawings. The Contractor is responsible for providing thrust restraint as incidental items in the Contract Price.

3.019 THRUST TIES

- A. The Contractor shall install thrust ties at all locations necessary to restrain thrust forces. Such thrust ties are subject to the review and approval of the Engineer. The concrete for all thrust ties shall develop a minimum compressive strength of 3,000 psi at 28 days.

3.020 THRUST BLOCKING

- A. Thrust blocking shall be adequate to withstand hydrostatic test pressures as well as normal operating pressures. Place thrust blocking between undisturbed ground and the fitting to be anchored. Place the blocking so that the pipe and fitting joints will be accessible for repairs. The concrete for all thrust blocks shall develop a minimum compressive strength of 3,000 psi at 28 days.
- B. For gravity or low pressure pipeline, when the bearing surface of the fitting against the soil provides an area equal to or greater than the area required for thrust restraint, concrete thrust blocks will no longer be required. The bearing area for fittings without thrust blocks will be determined by the projected area of 70 percent of the internal

diameter multiplied by the chord length for the curve along the centerline of the fitting.

3.021 INSTALLATION OF EXPOSED PIPING

- A. Unless shown otherwise, piping shall be parallel to building lines. Hangers on adjacent piping shall be aligned where possible on common size ranges.
- B. 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.
- C. Unions shall be installed where required for piping or equipment installation, even though they are not shown on the Drawings.
- D. Piping shall be installed without springing or forcing the pipe in a manner which would set up stresses in the pipe, valves, or connected equipment.

3.022 ANCHORAGE AND EXPANSION PROVISIONS

- A. All piping shall be anchored against thrust developed by internal pressures. In addition, provisions shall be made for the expansion and contraction which may occur in pipe due to temperature change. Pipe anchorage and expansion provisions are not completely detailed on the Drawings. The absence of these details on any Drawings shall not relieve the Contractor of the responsibility for providing them where required.

3.023 INSTALLATION OF FLEXIBLE COUPLINGS, FLANGED COUPLING ADAPTERS, AND SERVICE SADDLES

- A. Prior to installation, thoroughly clean oil, scale, rust, and dirt from the pipe to provide a clean seat for the gasket. Care shall be taken that the gaskets are wiped clean before they are installed. If necessary, flexible couplings and flanged coupling adapter gaskets may be lubricated with soapy water or manufacturer's standard lubricant before installation on the pipe ends. Install in accordance with the manufacturer's recommendations. Bolts shall be tightened progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform tightness. Workmen tightening bolts shall use torque-limiting wrenches.
- B. Flexible couplings with tie rods may be used to tie pipes against thrust. They shall not be used, with or without tie rods, as expansion joints on pipelines with cyclic temperature changes. Readjust tie rod tension after initial filling before pressure testing.

3.024 CORROSION PROTECTION OF PIPE AND ACCESSORIES

- A. Not all corrosion protection details are included, either on the Drawings or in the Specifications. The absence of specific details on corrosion and environmental protection measures shall not relieve the Contractor of the responsibility of providing them, all as part of the Contract price.

3.025 CORROSION PROTECTION FOR BURIED PIPE ACCESSORIES

- A. All buried pipe appurtenances made of steel shall have corrosion protection. Tie rods and similar items shall be heat shrink tube wrapped. Flange bolts, nuts, and similar items shall be coated with a bituminous paint or equal. Flexible couplings, grooved couplings, and similar items shall be heat shrink wrapped or cement coated.
- B. Buried valves and similar elements on wrapped pipelines shall be bituminous paint-coated. On ductile iron or nonmetallic pipelines they shall have exposed nuts and bolts bituminous paint-coated and the entire valve wrapped in 8-mil polyethylene as specified for ductile iron pipe. On cement-coated pipelines they shall be cement-coated similar to

detail shown for couplings.

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

SECTION 33 30 00 – PIPING SYSTEMS

PART 1. GENERAL

1.01 SCOPE OF WORK

- A. This section covers the work necessary to furnish and install the piping systems. The pipe system to be used for each process system is shown on the plans.
- B. For trench excavation, backfill, pipe bedding, and material placed in the pipe zone, see Section TRENCH EXCAVATION AND BACKFILL.
- C. See Division 1 GENERAL, which contains information and requirements that apply to the work specified herein and are mandatory for this project.
- D. The Contractor shall furnish and install pipe and fittings as shown on the Drawings and as specified in these Specifications. The pipe shall be new, manufactured in accordance with these Specifications and Drawings.
- E. Piping systems, including pipe, fittings, anchors, and all other elements, shall be detailed, fabricated, and installed to resist all internal and external loads which will be imposed upon them. Pressure ratings and materials stated in these Piping Specification sections are minimum acceptable standards. Systems shall be suitable for the service intended.
- F. The pipe diameters shown on the Drawings and used in these Specifications are inside diameters unless specific reference is made to outside diameter of the pipe or the pipe is a standardized product normally designated by a nominal size, e.g., ductile iron pipe.

1.02 SUBMITTALS DURING CONSTRUCTION

Submittals during construction shall be made in accordance with Section 01 30 00. In addition, the following specific information shall be provided.

A. FIELD FABRICATION

- 1. For pipelines which are assembled in the field from standard fittings, submit complete data on pipe, fittings, linings, coatings, any manufacturer's installation instructions, and any required installer certifications.

B. FABRICATION AND LAYING DRAWINGS

- 1. For shop fabricated piping, the Contractor shall furnish the Engineer with pipe design calculations, the required test data, and shop drawings which shall include a laying plan and details of pipe sections, special fittings, and bends. Dimensions, coatings, and other pertinent information shall be shown. The laying plan shall show the location of each pipe section and each special length, with each piece numbered or otherwise designated in sequence. All outlets and bends shall be made up into special lengths so that, when installed, they will be located as indicated. Each pipe and fitting shall be marked on the outside to indicated the class of pipe, location number on the laying plan, size or diameter, manufacturer's identification, and date of manufacture. Pipe shall be furnished and installed in accordance with the reviewed laying plan.

C. PIPE SUPPORT DRAWINGS

- 1. Drawings of each major piping system locating each support and hanger. Drawings shall identify the support type by catalog number or shop drawing detail

number and show anchor locations, identifying them by shop drawing detail number.

D. MATERIAL CERTIFICATION

1. Certification of all materials, and manufacturing properly executed by the manufacturer, shall be available to show compliance with the Specification of materials being furnished. Test data on tests performed shall be provided as requested by the Engineer.

E. FIELD WELDING PROCEDURE

1. Details of welding procedures for each type of field weld, including base metal, welding method, electrodes, preheating requirements, and other data.

F. PLUMBING CODE

1. All sanitary building drainage and vent systems shall conform to the plumbing laws, rules, and regulations of the state and of the City, whichever represents the higher standard.
2. The Owner will obtain any variances imposed by site constraints.

1.03 QUALITY ASSURANCE

- A. Installer shall be a Specialist.

1.04 PROJECT SITE CONDITIONS

- A. Locate and provide protection of existing utilities affected by the work. Minimize disruptions to access existing facilities.

PART 2. PRODUCTS

2.01 MATERIALS

A. GALVANIZING

1. Where galvanizing is specified it shall be hot-dip applied only. Electroplated zinc or cadmium plating is unacceptable.

B. PAINTING

1. All exposed piping, including piping within vaults, basins, and manholes, and except copper, stainless steel, and galvanized piping, shall be painted as specified in Section 09 90 00 PAINTING.

C. PIPE PENETRATIONS

1. Penetrations shall be constructed per specifications and as detailed on drawings.
2. Penetration reinforcing shall be construction as detailed on structural drawings.
3. ABOVE GRADE SLAB, FLOOR, WALL, AND ROOF PENETRATIONS
 - a. All ductile iron penetrations of slabs, floors, walls, and roofs shall be poured in place ductile iron wall pipe. It shall be the Contractor's responsibility to verify the size and location of all building and structure penetrations prior to pouring concrete. All sleeves shall be supported by form work to prevent contact with the reinforcing steel.

D. RUBBER GASKET STORAGE

1. Store all rubber gaskets in a cool, well-ventilated place, and do not expose to the direct rays of the sun. Do not allow contact with oils, fuels, or petroleum solvents.
- E. JOINT LUBRICANT
 1. Furnish joint lubricant with the pipe. Furnish the amount and type recommended by the pipe manufacturer. The lubricant shall be a water-soluble, nontoxic, vegetable soap compound conforming to United States Pharmacopoeia No. P39.
- F. HYDROSTATIC TESTING
 1. Provide all hoses, plugs, and other necessary equipment to complete the tests.

PART 3. EXECUTION

3.01 SHIPPING AND HANDLING MATERIALS

- A. During transportation, unloading, and storage, pipe and materials shall be protected, supported, and handled in a manner to prevent damage to the materials, especially linings and coatings. Only implements and equipment suitable for proper and safe handling of the materials shall be used. Fabric slings shall be used to lift pipe and fittings, not chains or cables.

3.02 INSTALLATION

- A. PIPE PREPARATION AND HANDLING
 1. Each pipe and fitting shall be carefully inspected before the exposed pipe or fitting is installed or the buried pipe or fitting is lowered into the trench. The interior and exterior protective coating shall be inspected, and all damaged areas patched in the field with material similar to the original, except damaged glass-lined pipe. Any damaged glass-lined pipe shall not be used and shall be promptly removed from the plant site. Any pipe which, in the opinion of the Engineer, is damaged beyond repair shall be removed from the site and replaced with another unit. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after installation.
 2. Use proper implements, tools, and facilities for the safe and proper protection of the pipe. Carefully handle pipe in such a manner as to avoid any physical damage to the pipe. Do not drop or dump pipe from trucks or into trenches under any circumstances. All pipe fittings and appurtenances shall be installed in accordance with the manufacturer's instructions and these Specifications.
- B. CUTTING AND FABRICATING
 1. Cut pipe with approved cutters, do not flame cut except for mild steel pipe. Cut perpendicular to axis of pipe. Dress ends to suit type of joint being made, removing burrs, mill scale, and debris before making up. Repair damaged linings and coatings.
- C. BELL HOLES
 1. Excavate bell holes at each joint to permit proper assembly and visual and feeler gauge inspection of the entire joint.
- D. EXPANSION PROVISIONS
 1. Provisions shall be made for the expansion and contraction which may occur in pipe due to temperature change. Pipe expansion provisions are not completely

detailed on the Drawings. The absence of these details on any Drawing shall not relieve the Contractor of the responsibility for providing them where required, and at his sole expense.

E. PIPE IN CONCRETE ENCASEMENTS OR CONCRETE BEDDING

1. Except for welded joints, pipe joints shall not be encased in concrete unless specifically required on the Drawings. Pipe coatings shall be continuous through concrete encasements, thrust blocks, anchors, collars, etc., unless otherwise shown on the Drawings.

F. FLEXIBLE JOINTS AT CONCRETE BACKFILL OR ENCASEMENT

1. Except for welded joint pipe, a flexible joint shall be provided within 18 inches or one-half the pipe diameter, whichever is less, from the terminations of any concrete backfill or concrete encasement.

G. FLEXIBLE JOINTS AT CONCRETE STRUCTURES

1. Unless shown otherwise on the plans, a flexible joint shall be provided at the face of all manholes or other structures. The joint may be flush with the face, may be up to one half pipe diameter away from the face, but shall not be more than 18 inches away from the face.
2. A second flexible joint shall be provided within 18 inches of the first joint for pipelines smaller than 18 inches in diameter or within one pipe diameter of the first joint for pipelines larger than 18 inches in diameter.
3. Flexible joints may be rubber ring joints, mechanical joints, flexible couplings, grooved couplings, or Brico Depend-o-Lok couplings.

H. LINE AND GRADE

1. Grade the bottom of the trench by hand, if necessary, to the line and grade to which the pipe is to be laid, with proper allowance for pipe thickness and for base. Remove hard spots that would prevent a uniform thickness of base or uniform pressure on the pipe barrel.
2. Lay pipe to a uniform grade between indicated elevations. Do not deviate more than 1 inch from line or 1/4 inch from established grade. Measure for grade at the pipe invert.
3. Before laying each section of pipe, check the grade with as straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

I. PERMISSIBLE DEFLECTION AT JOINTS

1. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, do not exceed 75 percent of the amount of deflection recommended by the pipe or coupling manufacturer.

J. LAYING AND JOINTING PIPE AND FITTINGS

1. After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and the rubber ring immediately before joining the pipe. Make assembly of the joint in accordance with the

recommendations of the manufacturer. Provide all special tools and appliances required for the jointing assembly.

2. The gasket position shall be checked with a feeler gauge, furnished by the pipe manufacturer, to assure proper seating. After the joint has been made, check pipe for alignment and grade. After sufficient pressure in making the joint to assure that the joint is "home", as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed.
3. Take the necessary precautions required to prevent excavated or other foreign material from entering the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workmen are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.
4. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.
5. When cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer.

K. UNSUITABLE CONDITIONS FOR LAYING PIPE

1. Do not lay pipe in water, or when in the opinion of the Engineer, trench conditions are unsuitable.

L. PREVENTING TRENCH WATER FROM ENTERING PIPE

1. When the pipe laying is not in progress, close the open ends of pipe by approved means, and do not permit trench water or other foreign material to enter the pipe. Keep water out of the trench.

M. INSTALLATION OF EXPOSED PIPING

1. Unless shown otherwise, piping shall be parallel to building lines. Hangers on adjacent piping shall be aligned where possible on common size ranges.
2. 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.
3. Unions shall be installed where required for piping or equipment installation, even though they are not shown on the Drawings.
4. Piping shall be installed without springing or forcing the pipe in a manner which would set up stresses in the pipe, valves, or connected equipment.
5. Required straight runs of piping upstream and downstream of flow measuring devices shall be smooth.

N. ANCHORAGE AND EXPANSION PROVISIONS

1. All piping shall be anchored against thrust developed by internal pressures. In addition, provisions shall be made for the expansion and contraction which may occur in pipe due to temperature change. Pipe anchorage and expansion provisions are not completely detailed on the Drawings. The absence of these details on any

Drawings shall not relieve the Contractor of the responsibility for providing them where required.

O. **INSTALLATION OF FLEXIBLE COUPLINGS, FLANGED COUPLING ADAPTERS, GROOVED JOINT COUPLINGS, DEPEND-O-LOK COUPLINGS, AND SERVICE SADDLES**

1. Prior to installation, thoroughly clean oil, scale, rust, and dirt from the pipe to provide a clean seat for the gasket. Care shall be taken that the gaskets are wiped clean before they are installed. If necessary, flexible couplings and flanged coupling adapter gaskets may be lubricated with soapy water or manufacturer's standard lubricant before installation on the pipe ends. Install in accordance with the manufacturer's recommendations. Bolts shall be tightened progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform tightness. Workmen tightening bolts shall use torque-limiting wrenches.
2. Flexible couplings with tie rods may be used to tie pipes against thrust. They shall not be used, with or without tie rods, as expansion joints on pipelines with cyclic temperature changes. Readjust tie rod tension after initial filling before pressure testing. Depend-o-Lok type FxF couplings as manufactured by Brico Industries may be used in lieu of flexible couplings with tie rods.

P. **CORROSION PROTECTION OF PIPE AND ACCESSORIES**

1. Not all corrosion protection details are included, either on the Drawings or in the Specifications. The absence of specific details on corrosion and environmental protection measures shall not relieve the Contractor of the responsibility of providing them, all as part of the Contract price.

Q. **CORROSION PROTECTION FOR BURIED PIPE ACCESSORIES**

1. All buried pipe appurtenances made of steel shall have corrosion protection. Tie rods and similar items shall be heat shrink tube wrapped. Flange bolts, nuts, and similar items shall be coated with a bituminous paint or equal. Flexible couplings, grooved couplings, and similar items shall be heat shrink wrapped or cement coated.
2. Buried valves and similar elements on wrapped pipelines shall be bituminous paint-coated. On ductile iron or nonmetallic pipelines they shall have exposed nuts and bolts bituminous paint-coated and the entire valve wrapped in 8-mil polyethylene as specified for ductile iron pipe. On cement-coated pipelines they shall be cement-coated similar to detail shown for couplings.

R. **UV PROTECTION FOR EXPOSED PVC PIPE AND PVC ACCESSORIES**

1. All PVC & accessories exposed to sunlight must have stabilizers and UV inhibitors to shield against ultraviolet radiation.

3.03 TRACER WIRE FOR PIPE LOCATION

- A. All new piping is to include tracer wire for future pipe location work. Tracer wire to be attached to top of piping, and tied down at 10-ft intervals. Prior to construction, the Contractor is required to provide submittal with all proposed tracer wire box locations.
- B. Tracer Wire - #12 AWG Solid (0.0808" diameter), steel core soft drawn high strength tracer wire, 380# average tensile break load, 30 mil high molecular weight-high density blue polyethylene jacket complying with ASTM-D-1248, 30 volt rating, (Copperhead Industries Part # 1230-HS Blue, or approved equal).

C. Tracer Wire Color Requirements -

1. Sewer Pipe: Green
2. Non-Potable Water Pipe: Purple
3. Potable Water Pipe: Blue

D. Tracer Box – (Copperhead Industries)

1. Materials used to construct products in above specifies scope shall be non-corrosive or corrosion resistant.
2. Tube material shall be of high grade ABS, or equivalent rigid plastic that meets or exceeds ASTM D-1788, Type 1 requirements.
3. Lid material shall be of cast iron or ductile iron. Tensile strength or ductility of such material shall be equal or superior to hi-tensile cast iron ASTM A-126-B requirements.
4. Lid-locking bolt material shall be made of aluminum material equal or superior to ASTM B-253.
5. Lid-locking mechanism material shall be made of plastic to meet or exceed ASTM A-126-B requirements.
6. Box shall be designed to be easily detected by magnetic and electronic locators even when box is covered by a minimum of four (4) inches of soil, sod and / or paving material.
7. A magnet shall be securely attached at the top of the upper tube of the box for locating purposes. Material used to retain magnet in place shall remain effective at minus 15 degrees Fahrenheit. A magnetized lid or magnet attached to the lid is not acceptable.
8. Locking Mechanism:
 - a. Lid of valve box shall be designed to employ a locking mechanism that will clamp it to the box collar in a closed position.
 - b. Locking mechanism shall incorporate a standard pentagon-shaped head bolt which when measured from flat to vertex shall not be less than 0.830 inches or greater than 0.875 inches.
 - c. Locking mechanism shall be such that the lid cannot be removed without using the proper wrench.
9. Copperhead Industries Lite Duty Box #LD14 (landscape areas), Copperhead Industries Concrete/Driveway Box #CD14 (concrete pavement), Copperhead Industries Heavy Duty #HS14 (roadway pavement).

E. Tracer Wire Connectors – Connectors suitable for direct-bury with moisture displacement silicone filled caps for resistance protection, (Copperhead Industries Snakepit connectors, or equal). Connectors are to be equal to 3M DBR wire connectors.

3.04 TESTING

1. All tests shall be conducted in the presence of the Owner or their appointed designee. The Contractor shall provide the Owner 48 hours notice prior to conducting any tests.

2. Isolate new sections of line to be tested by providing temporary valves, caps, plugs and/or by closing permanently installed valves. Test sections shall normally be limited to 1,500 feet in length or as defined below. Plugs or temporary valves used to close the pipe for the hydrostatic test must be securely braced to prevent the unintentional release of a plug or valve which can become a high velocity projectile. Gauges, air piping manifolds, and valves shall be at the top of the ground. No one is permitted to enter an excavation or structure where a plugged pipe is under test pressure.
3. All leaks shall be repaired and remedied, with tests and repairs repeated until the system meets testing requirements to the satisfaction of the Engineer.
4. All water necessary for testing shall be provided by the Contractor.
5. Upon completion of each portion of the system and prior to connecting to any facility impacted by solids, the system shall be thoroughly flushed to remove and catch all foreign matter such as rocks, misplaced tools, and debris.
6. Valves:
 - a. Valves shall be tested at the same time that the adjacent pipeline is pressure tested. Joints and valve mechanism shall show no visible leakage under test or normal operating conditions. The Contractor shall repair joints that show signs of leakage prior to final acceptance. If there are any special parts of control systems or operators that might be damaged by the pipeline test, they shall be properly protected. The Contractor will be responsible for repairing any damage caused by the testing.
 - b. If requested by the Engineer, the valve manufacturer shall furnish an affidavit stating the material options furnished and/or that he has complied with these and other referenced specifications.
 - c. Valves shall be flushed and disinfected at the same time as adjacent water main, in accordance with WSDOT Section 7-09.3(24).
7. GRAVITY SEWER PIPE TESTING

All new gravity sewer pipes are to be pressure tested per WSDOT 7-17.3(2).
8. PRESSURE SEWER TESTING
 - a. All sewer force main piping shall pass a hydrostatic pressure test of 1.5 times operation pressure or 150 psi, whichever is greater. Test duration to be 15 minutes (per the 2008 Department of Ecology Criteria for Sewage Works).
 - b. Required Pressure Test Pressures:
 - (i) Mixed Liquor Forcemains: 150psi
 - (ii) West Plant Drain Pump Station Forcemain: 150 psi
 - (iii) 3W & 2W Piping: 200 psi
9. WATER LINE TESTING AND DISINFECTION
 - a. All water mains and appurtenances shall pass a hydrostatic pressure test per WSDOT 7-09.3(23).
 - b. Required Pressure Test Pressures:
 - (i) Potable Water Distribution Piping: See WSDOT 7-09.3(23).

- c. The Contractor shall disinfect, flush and provide a satisfactory bacteriological report to the Owner or their appointed representative in accordance with WSDOT/APWA Section 7-09.3(23). The Contractor shall also provide two chlorine concentration test reports to show the initial chlorine concentration is at least 50 mg/L, and to show the 24-hour residual chlorine concentration is at least 25 mg/L. All tests must be performed by a DOH-certified testing laboratory and sample-taking shall be witnessed by the Owner or their appointed representative. Chlorinated flush water must be de-chlorinated and discharged to nearby vegetated areas in a manner that does not cause flooding or erosion.
- d. The Contractor shall arrange for water sampling and pay for all chlorine concentration and bacteriological tests associated with water main disinfection and chlorine neutralization.

10. HDPE PIPE TESTING

- a. Pressure testing of the HDPE water mains shall comply with ASTM F2164, “Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure”, and Performance Pipe Technical Note 802 – Leak Testing of Polyethylene Pipe for Municipal and Industrial Applications.

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

SECTION 33 31 00 – WASTEWATER PIPING

PART 1. GENERAL

1.01 SCOPE OF WORK

- A. This section covers the work necessary to furnish and install wastewater lines as shown on the plans and described herein.
- B. See Section 33 30 00 PIPING SYSTEMS for additional requirements.

PART 2. PRODUCTS

2.01 MATERIALS

- A. BUILDING / STRUCTURE FOOTING DRAIN PIPE
 - 1. Perforated Corrugated Polyethylene Drainage Tubing Underdrain Pipe:
 - 2. Pipe per WSDOT 9-05.2(7), 4-inch diameter unless otherwise shown on the plans.
- B. PRESSURE SEWER PIPE
 - 1. Exposed:
 - a. Stainless Steel Sch. 80 Pipe or Ductile Iron: AWWA C115, cement lined, thickness class 53 for flanged or grooved piping systems.
 - 2. Buried:
 - a. AWWA C115, Ductile Iron cement lined 8 mil poly wrapped thickness class 50 or 51; unless flanged or grooved piping systems which are required to be thickness class 53.
 - b. PVC, AWWA C900/C905, Class 235 DR 18 (minimum), or
 - c. HDPE (pressure class as specified on drawings) in accordance with WSDOT Section 9-30.1 and Spec Section 33 05 33.
 - d. Or as noted on the plans.
- C. GRAVITY SEWER PIPE
 - 1. PVC for wastewater applications:
 - a. ASTM D3034, SDR 35 for 4" through 15" pipe. ASTM F679, SDR 35 (PS46) for 18" & larger pipe. Or as noted on the plans
 - 2. Ductile Iron for wastewater applications:
 - a. WSDOT 9-05.13 Ductile Iron Sewer Pipe. Ductile Iron cement lined 8 mil poly wrapped thickness class 50 or 51; unless flanged or grooved piping systems which are required to be thickness class 53
- D. JOINTS
 - 1. BURIED PIPE
 - a. Mechanical or push-on joints to be in accordance with AWWA C111 for ductile iron pipe. Anchoring of mechanical joints with external set screws will not be permitted. PVC gravity pipe to be in accordance with ASTM

D3212 - Specification for Joints, for Drain and Sewer Plastic Pipe using Flexible Elastomeric Seals.

b. Joints for foul air PVC piping shall be glued.

2. EXPOSED PIPE

a. Flanged joints shall be in accordance with AWWA C115. Grooved and shouldered joints shall be in accordance with AWWA C-606.

E. FITTINGS

1. Cast or ductile iron in accordance with AWWA C110 and/or AWWA C153, short body type, 250 psi working pressure. Where taps are shown on fittings, tapping bosses shall be provided.

2. PVC gravity pipe to be in accordance with ASTM D3034 or ASTM F679.

F. FLEXIBLE COUPLINGS AND FLANGED COUPLING ADAPTERS

1. Flexible couplings for use with PVC piping shall be Romac Style 501, or approved equal. When restraining is required use Romac 611 Restraining system. Bolts and nuts shall be stainless steel type 316. Center ring shall have fusion bonded epoxy coating and have a length of 2x the pipe diameter. Ductile iron sleeves with mechanical joints at each end may be substituted for flexible couplings on ductile iron pipe. Mechanical joint shall be Romagrip, Megalug 1100, or approved equal.

2. Protection for Buried Couplings and Adaptors:

a. Double wrap with polyethylene encasement, AWWA C105 and tape the edges of the encasement with PVC tape.

G. HOSES FOR 1" YARD HYDRANTS

1. Hoses to be 3/4" fire hose, 50' lengths, NPSH couplings and adaptors as needed, rated for 200# test pressure. Provide two hoses for each 1" yard hydrant.

H. CEMENT LINING

1. All ductile iron pipe and fittings shall be cement mortar lined and seal coated in accordance with ANSI A21.4/AWWA C104.

I. COATING

1. All ductile iron pipe to be buried shall receive a coat of bituminous material. All exposed ductile iron pipe (including all piping in valve vaults) is to be cleaned and shop coated with two coats of epoxy per Section 09900 Painting. All bituminous material on exposed piping is to be sand blasted off, prior to application of epoxy.

J. GROOVED

1. Grooved couplings shall be Victaulic style 31 for ductile iron pipe, or equal. Couplings for steel or galvanized pipe shall be Victaulic style 07 for rigid systems or Victaulic style 77 for flexible systems. Grooved dimensions shall be per manufacturer's standards.

K. FLANGES

1. ANSI A21.15/AWWA C115, threaded, 250 psi working pressure, 125-pound ANSI drilling.

L. BOLTS

1. To be ASTM A 307, Grade A hex head bolts and nuts for Class 125 FF Flanges.
Required Coatings:
 - a. Flanged Fittings Inside Building 316 Stainless Steel Nuts & Bolts
 - b. Flanged Fittings Outdoor Exposed 316 Stainless Steel Nuts & Bolts
 - c. Flanged Fittings Buried Underground Manufacturer's Standard
 - d. Flanged Fittings in Contact W/ Sewage 316 Stainless Steel Nuts & Bolts
 - e. Buried T-Head Cor-Ten Material
 - f. For Mechanical and Grooved JointsManufacturer's Standard, or provide bolt & nut material as described above, as a minimum requirement.
 - g. Or provide as noted on plans.

M. GASKETS

1. Gaskets for mechanical or push-on joints shall be rubber conforming to ANSI A21.11, AWWA C111.
2. All gaskets for ductile iron air piping shall be EPDM (Ethylene Propylene-Diene Monomer) material.
3. Gaskets for flanged joints in sewage or water service shall be 1/8 inch thick, cloth-inserted rubber conforming to applicable parts of ANSI B16.21 and AWWA C207. Gasket material shall be free from corrosive alkali or acid ingredients. Gaskets shall be one-piece, full-face, with holes to pass bolts. Gaskets for grooved joints shall be Flushseal type, halogenated butyle or nitrile depending on service.
4. Gaskets for PVC joints shall be elastomeric seals conforming to ASTM F477.

N. LUBRICANT

1. Lubricant for mechanical joint end piping shall be manufacturer's standard.

O. RESTRAINED JOINT PIPE

1. Joints for buried pressure pipe may be "restrained type". However, the use of restrained joints in lieu of thrust blocks will be acceptable only if the pipe configuration, soil conditions, and restrained length are suitable in the opinion of the Engineer.

P. PIPE SUPPORTS

1. Stainless steel adjustable saddle supports with 1/4" neoprene cushion under piping. Standon Model S92 Saddle Supports as supplied by Material Resources (503) 693-0727, or approved equal.

Q. SERVICE SADDLES

1. Ford Iron Service Saddles, Style FC202 with stainless steel bands and epoxy coating and 1/4" neoprene cushion, or approved equal.

R. INSULATION, SHIELDS, AND JACKETING

1. PIPE INSULATION

All above grade pipe which transports wastewater shall be insulated with closed cell polyisocyanurate cellular plastic manufactured by ITW Insulation Systems. Insulation shall be Trymer 2000 XP, 1.25" thick (minimum), designed for cold pipe fitting systems, installed per manufacturers recommendation. Minimum temperature range: -100 degree F to +220 degrees F. K factor at 75 degrees Fahrenheit shall not be more that 0.19 BTU-inch/hour-square feet degrees Fahrenheit. Fire rating flame spread of 25 or less. Joints shall be sealed with manufacturer's recommended contact adhesive to form continuous barrier. Density min 2-lb/ft³.

2. PIPE SHIELDS

All above grade pipe shall have 6" long pipe shields, 1.25 inches thick, at all supports and clamps. Pipe shields shall be Trymer 4000 with a min. 4-lb/ft³ density. Pipe shields shall be installed per manufacturers recommendations. Joints shall be sealed with manufacturer's recommended contact adhesive to form a continuous barrier.

3. PIPE INSULATION JACKETING

Insulation jacketing shall be installed over all exposed insulation and pipe shields to provide complete jacketing for all insulated piping and to provide durability. Jacketing shall be smooth finished aluminum; 0.016-inch (26 gauge) minimum thickness. Overlap circumferential joints 4 inches minimum; overlap longitudinal joints 1-inch minimum; longitudinal joints shall be oriented to minimize water entry. Bands shall be 0.5 inch wide, 0.0508 inch (16 gauge) thick aluminum or 0.0179 inch thick Type 304 stainless steel and shall be installed on 18 inch centers, uniformly spaced and at all fitting joints. Apply waterproof adhesive at joints and overlaps. All fittings shall be of the same jacketing material. Insulation jacketing shall be manufactured by ITW Insulation Systems or approved equal.

PART 3. EXECUTION

3.01 INSTALLATION

A. HANDLING PIPE

1. Handle per manufacturer's recommendations. Take care not to damage lining when handling pipe.

B. CUTTING PIPE

1. Cut pipe with milling type cutter, rolling pipe cutter, or abrasive saw cutter. Do not flame cut. Do not damage linings. Cuts shall leave a smooth end at right angles to the pipe axis.

C. DRESSING CUT ENDS

1. Dress cut ends of pipe in accordance with the type of joint to be made. Dress cut ends of mechanical joint pipe to remove sharp edges or projections which may damage the rubber gasket.
2. Dress cut end of push-on joint pipe by beveling, as recommended by the pipe manufacturer.

3. Dress cut ends of pipe for flexible couplings and flanged coupling adapters as recommended by the coupling or adapter manufacturer.

D. FABRICATION OF FLANGED PIPE AND FITTINGS

1. Flanged pipe and fittings shall be fabricated in the shop, not in the field, and delivered to the job site with flanges in place and properly faced. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by the manufacturer. Flanges shall be faced after fabrication in accordance with AWWA C115.

E. JOINTING PIPE

1. FLANGED

- a. Prior to connecting flanged pipe, the faces of the flanges shall be thoroughly cleaned of all oil, grease, and foreign material. The rubber gaskets shall be checked for proper fit and thoroughly cleaned. Care shall be taken to assure proper seating of the flange gasket. Bolts shall be tightened so that the pressure on the gasket is uniform. Torque-limiting wrenches shall be used to ensure uniform bearing insofar as possible. If joints leak when the hydrostatic test is applied, the gaskets shall be removed and reset and bolts retightened.

2. MECHANICAL, GROOVED, AND PUSH-ON JOINT

- a. Join pipe with mechanical or push-on type joints in accordance with the manufacturer's recommendations. Tools and devices, such as special jacks, chokers, and similar items required for proper installation. Grooved systems may employ Victaulic field grooving tools, including cut and/or roll groovers as needed. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer, and no substitutes will be permitted under any circumstances.

F. SPECIAL REQUIREMENTS FOR WATER LINES NEAR SEWER LINES

1. Construction requirements for water and sewer lines near sewer line either running adjacent to or crossing shall be in accordance with all requirements as specified in Washington State Department of Ecology, Criteria for Sewage Works Design, C1-9 Special Requirements.

3.02 TESTING

- A. See 33 30 00 Piping Systems.

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

SECTION 33 32 00 – WATER DISTRIBUTION PIPING

PART 1. GENERAL

1.01 SUMMARY

- A. Work includes but is not limited to following:
 - 1. Installation of DI water main and appurtenances;
 - 2. Chlorination, de-chlorination, pressure testing and start-up of water mains and water services;
 - 3. Recording as-built information in accordance with Section 01 70 00;
 - 4. Preparation of record (as-built) drawings as required in Section 01 70 00.
- B. Contractor shall provide a complete working installation with all equipment called for in proper operating condition. Documents do not undertake to show or list every item to be provided. When an item not shown or specified is clearly necessary for proper operation of equipment shown or specified, provide an item which will allow the system to function properly at no increase in Contract Sum.
- C. Piping systems, including pipe, fittings, anchors, and all other elements, shall be detailed, fabricated, and installed to resist all internal and external loads which will be imposed upon them. Pressure ratings and materials stated in these Piping Specification sections are minimum acceptable standards. Systems shall be suitable for the service intended.
- D. The pipe diameters shown on the Drawings and used in these Specifications are inside diameters unless specific reference is made to outside diameter of the pipe or the pipe is a standardized product normally designated by a nominal size, e.g., HDPE pipe.
- E. The Contractor shall furnish and install pipe and fittings as shown on the Drawings, as specified in these Specifications, and as required for a complete and functional installation. The pipe shall be new, manufactured in accordance with these Specifications and Drawings.

1.02 REFERENCES

- A. Comply with the requirements of Section 01 41 00, Regulatory Requirements, and as listed herein.
- B. WSDOT Latest Edition Standard Specifications for Road, Bridge and Municipal Construction.
- C. WSDOT Standard Plans for Road, Bridge and Municipal Construction
- D. American Water Works Association (AWWA).

1.03 SUBMITTALS

- A. Submittals shall be in accordance with requirements of Division 1 and as specified. In addition, the following specific information shall be provided:
 - 1. Field Fabrication
For pipe lines which are assembled in the field from standard fittings, submit complete data on pipe and fittings, including any manufacturer's installation instructions.

2. Material Certification

Certification of all materials and manufacturing, properly executed by the manufacturer, shall be available to show compliance with the Specification of materials being furnished. Test data on tests performed shall be provided as requested by the Engineer.

- B. Submittals for all pipe and appurtenances (fittings, valves, valve boxes, services and appurtenances, etc.)
- C. The Contractor shall submit a water main shut-down / temporary bypass plan prior to performing Work. The plan shall include an anticipated schedule for shut-downs, schedule for notification of customers (construction notice, shut-down notice), sample notification (letter, door hanger). Customers shall be notified about construction activities one week in advance and water shut-downs at least 48-hours in advance. This plan shall also include the contingency provisions the Contractor will have in place to provide water to residential customers in the event that a shut-down lasts longer than 6-hours.

1.04 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with the requirements of Section 01 45 00 and as specified.
- B. Installer shall be a Specialist and experienced in the installation of potable water systems.
- C. Regulatory Requirements: See referenced Codes, ordinances, and standards in Section 01 41 00 Regulatory Requirements.

1.05 PROJECT SITE CONDITIONS

- A. Locate and provide protection of existing utilities affected by the work.
 - 1. Existing Pipe Verification

Expose all existing pipes which are to be connected to new pipelines. Verify the size, material, elevation, horizontal location, and pipe service of these existing pipes with sufficient lead time to make accommodations as necessary. Connections to the existing pipe system shall be at a restrained joint or fitting.
- B. Minimize disruptions to access, existing water service connections and existing facilities.

PART 2. PRODUCTS

2.01 GENERAL

- A. All materials and equipment shall comply with "Quality Assurance" provisions and Manufacturer's data. Where these may be in conflict, the more stringent requirements govern.
- B. All items of materials in each category of equipment shall be of one manufacturer.
- C. Groups of items having same or similar function shall be by single manufacturer to facilitate maintenance and service.
- D. All materials and equipment shall be compatible with space allocated. Modifications necessary to adjust items to space limitations shall be at Contractor's expense.
- E. All materials and equipment shall conform with conditions shown and specified. Coordinate with other trades for best possible assembly of completed Work.

- F. All materials and equipment installed shall be fully operational and without objectionable noise or vibration.

2.02 PIPE AND JOINTS

A. Buried Pipe

1. PVC potable and raw water piping shall be AWWA C900 Class 235 DR 18 (minimum) with rubber gasketed joints. Fittings shall be ductile iron (AWWA C-110 or AWWA C-153). Buried ductile iron fittings shall be polyethylene encased in accordance with pipe manufacturer's recommendations and WSDOT 9-30.1(2).
2. Ductile Iron (DI) potable and raw water piping shall be standard thickness Class 50 (AWWA C-151) push-on joints or M.J. joints. Pipe shall be cement mortar lined (AWWA C-104). The pipe shall be of 150 psi working pressure, plus 100 psi surge pressure. Fittings shall be ductile iron (AWWA C-110 or AWWA C-153). Buried ductile iron pipe and fittings shall be polyethylene encased in accordance with pipe manufacturer's recommendations and WSDOT 9-30.1(2).

2.03 SERVICE PIPES

- A. Potable water service pipe shall be high-density polyethylene (HDPE) in accordance with the drawings and the following:
 1. Polyethylene (PE) piping shall be manufactured from high molecular weight, PE 4710 conforming to the requirements of ASTM D-3350. Piping shall conform to the requirements of AWWA C901 and ASTM F714. Piping shall be installed from continuous coil with fusion weld joints. Fittings shall be compression type fittings suitable for pressure piping applications. Pipe and fittings shall meet requirements as shown on the Plans.

2.04 PIPE FITTINGS

- A. Ductile iron pipe fittings (reducers, bends, elbows, etc.) shall be cast or ductile iron in accordance with WSDOT 9-30.2(1) and ANSI B16.1/AWWA C110, short body type, 250 psi working pressure.
- B. HDPE fittings shall be standard commercial products manufactured by injection molding or by extrusion and machining. The fittings shall be fully pressure rated by the manufacturer to provide a working pressure equal to the pipe. Fitting shall be per WSDOT Standard Specification 9-30.2(10).

Ductile iron fittings may be used provided that the connection is restrained and made using a PE flange adapter or a mechanical joint adapter, and a structural support pad is installed underneath the fittings.

2.05 FLEXIBLE COUPLINGS / MECHANICAL JOINTS

- A. Flexible couplings for use with ductile iron pipe shall be Romac Style 501; or approved equal. Bolts and nuts shall be stainless steel type 316. Center ring shall have fusion bonded epoxy coating and have a length of 2x the pipe diameter. Ductile iron sleeves with mechanical joints at each end may be substituted for flexible couplings on ductile iron pipe. Mechanical joint shall be Romagrip, Megalug 1100, or approved equal.
- B. Restrained flexible couplings shall use Romac 611 Restraining System or approved equal.
- C. Joint Restraint: Provide joint harnesses (tie rod lug or attachment plate assemblies) designed for the test pressure across flexible couplings and flange coupling adaptors. For steel pipe the joint harness shall conform to the requirements of Chapter 13 of AWWA M-

11, paragraph 13.10, Table 13-6 - Tie Bolt Schedule for Harnessed Joints. Anchor studs may be used on flange coupling adapters for pipe up to 12 inches in diameter.

D. Protection for Buried Couplings and Adaptors:

1. Double wrap with polyethylene encasement, AWWA C105 and tape the edges of the encasement with PVC tape.

2.06 BOLTS AND NUTS

- A. Bolts and nuts for buried or exposed conditions shall be Type 304 stainless steel. Bolts and nuts for submerged conditions shall be Type 316 stainless steel.

2.07 RUBBER GASKETS

- A. Store all rubber gaskets in a cool, well-ventilated place, and do not expose to the direct rays of the sun. Do not allow contact with oils, fuels, or petroleum solvents.

2.08 JOINT LUBRICANT

- A. Furnish joint lubricant with the pipe. Furnish the amount and type recommended by the pipe manufacturer. The lubricant shall be a water-soluble, nontoxic, vegetable soap compound conforming to United States Pharmacopoeia No. P39.

2.09 HYDROSTATIC TESTING

- A. Provide all hoses, plugs, and other necessary equipment to complete the tests.

2.010 CONCRETE FOR THRUST BLOCKING, THRUST TIES AND ENCASEMENT

- A. The concrete for all thrust blocking and thrust ties shall develop a minimum compressive strength of 3,000 psi at 28 days.

PART 3. EXECUTION

3.01 SHIPPING AND HANDLING OF MATERIALS:

- A. During transportation, unloading, and storage, pipe and materials shall be protected, supported, and handled in a manner to prevent damage to the materials, especially linings and coatings. Only implements and equipment suitable for proper and safe handling of the materials shall be used. Fabric slings shall be used to lift pipe and fittings, not chains or cables.

3.02 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install in accordance with "Quality Assurance" provisions, "References," Specifications, and Manufacturer's recommendations. Where these may be in conflict, the more stringent requirements govern.
- B. All work and materials shall be subject to the approval of the Engineer and the Owner.

3.04 INSTALLATION OF PIPING

A. Line and Grade.

1. Survey line and grade shall be established prior to laying pipe per Standard Specification 7-09.3(5). Construction layout staking will be provided by the Owner.
2. In areas between survey stakes, transfer line and grade from the Plans to the water line trench and maintain said line and grade using construction practices in conformance with established industry standards.

B. Handling, Storage and Cutting of Pipe.

1. During transportation, unloading, and storage, pipe and materials shall be protected, supported, and handled in a manner to prevent damage to the materials, especially linings and coatings. Only implements and equipment suitable for proper and safe handling of the materials shall be used. Fabric slings shall be used to lift pipe and fittings, not chains or cables.
2. Each pipe and fitting shall be carefully inspected before the exposed pipe or fitting is installed or the buried pipe or fitting is lowered into the trench. The interior and exterior protective coating shall be inspected, and all damaged areas patched in the field with material similar to the original. Any pipe which, in the opinion of the Engineer, is damaged beyond repair shall be removed from the site and replaced with another unit. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after installation.
3. Use proper implements, tools, and facilities for the safe and proper protection of the pipe. Carefully handle pipe in such a manner as to avoid any physical damage to the pipe. Do not drop or dump pipe from trucks or into trenches under any circumstances.
4. Cut pipe with approved cutters, do not flame cut except for mild steel pipe. Cut perpendicular to axis of pipe. Dress ends to suit type of joint being made, removing burrs, mill scale, and debris before making up. Repair damaged linings and coatings.

C. Pipe Installation.

1. All pipe shall be installed in conformance with the manufacturer's recommended procedures for the pipe being installed, and in accordance with WSDOT Standard Specifications 7-08 and 7-09. A minimum of 3 feet of cover above the top of pipe shall be provided. Take precautions to prevent water from entering the trench or excavation. Do not lay pipe in water, or when in the opinion of the Owner or Engineer, trench conditions are unsuitable. Prevent excavated or other foreign material from entering the pipe during the laying operation. When laying operations are not in progress, at the close of the day's work, or when labor is absent from the job, close and block all open pipe ends to prevent entry of foreign material or creep of the gasketed joints.
2. Excavating and Backfilling: In accordance with requirements of Division 31. Provide all necessary shoring, sheeting, and pumping as part of Work of this Division.

3. Pipe Laying: After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and the rubber ring immediately before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer. Provide all special tools and appliances required for the jointing assembly. All water pipe shall be installed with the bell end upstream. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug. All pipe laid in the trench to the specified line shall be kept under longitudinal compression until the backfill has been compacted to the crown of the pipe. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation. Where field conditions prevent installation per the Plan line, notify the engineer immediately. The joint deflection between segments of the water main shall not exceed 75% of the manufacturer's recommended maximum deflection. Where joint deflection exceeds this limit, install the needed fittings to make the needed horizontal or vertical bend.
 4. Service Line Installation: Service lines shall be installed in accordance with WSDOT Standard Specifications Sections 7-08 and 7-15, and the Contract plans.
 5. Contractor shall mark all underground water mains and service lines with detector tape in accordance with the Plans and with requirements of Division 31.
- D. Joining Flanged Pipe:
1. Prior to connecting flanged pipe, the faces of the flanges shall be thoroughly cleaned of all oil, grease, and foreign material. The gaskets shall be checked for proper fit and thoroughly cleaned. Care shall be taken to assure proper seating of the flange gasket. Bolts shall be tightened so that the pressure on the gasket is uniform. Torque-limiting wrenches shall be used to ensure uniform bearing insofar as possible. If joints leak when the hydrostatic test is applied, the gaskets shall be removed and reset and bolts retightened.
- E. Except for welded joints, pipe joints shall not be encased in concrete unless specifically required on the Drawings. Pipe coatings shall be continuous through concrete encasements, thrust blocks, anchors, collars, etc., unless otherwise shown on the Drawings.
- F. Except for welded joint pipe, a flexible joint shall be provided within 18 inches or one-half the pipe diameter, whichever is less, from the terminations of any concrete backfill, or concrete encasement.
- G. Corrosion Protection of Pipe and Accessories:
1. Not all corrosion protection details are included, either on the Drawings or in the Specifications. The absence of specific details on corrosion and environmental protection measures shall not relieve the Contractor of the responsibility of providing them, all as part of the Contract price.
- H. Corrosion Protection for Buried Pipe Accessories:
1. All buried pipe appurtenances made of steel shall have corrosion protection. Tie rods and similar items shall be heat shrink tube wrapped. Flange bolts, nuts, and similar items shall be coated with a bituminous paint or equal. Flexible couplings, grooved couplings, and similar items shall be heat shrink wrapped or cement coated.

2. Buried valves and similar elements on wrapped pipelines shall be bituminous paint-coated. On ductile iron or nonmetallic pipelines they shall have exposed nuts and bolts bituminous paint-coated and the entire valve wrapped in 8-mil polyethylene as specified for ductile iron pipe. On cement-coated pipelines they shall be cement-coated similar to detail shown for couplings.
- I. Thrust Restraint:
1. All pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist shall be thrust restrained. Thrust blocks and ties may not be shown on the Drawings. The Contractor is responsible for providing thrust restraint as incidental items in the Contract Price.
 2. The Contractor shall install thrust ties at all locations necessary to restrain thrust forces. Such thrust ties are subject to the review and approval of the Engineer. The concrete for all thrust ties shall develop a minimum compressive strength of 3,000 psi at 28 days.
 3. Thrust blocking shall be adequate to withstand hydrostatic test pressures as well as normal operating pressures. Place thrust blocking between undisturbed ground and the fitting to be anchored. Place the blocking so that the pipe and fitting joints will be accessible for repairs. The concrete for all thrust blocks shall develop a minimum compressive strength of 3,000 psi at 28 days.
- J. Interface with other products:
1. Exact routing of piping and other items shall be governed by structural conditions or obstruction. Contractor shall make use of data in Contract Documents. In addition, Engineer reserves right, at no increase in Contract Sum, to make any reasonable change in location of pipe and appurtenances.
 2. Field verify all dimensions shown on the drawings prior to starting any work. The Contractor shall not be entitled to additional compensation for minor variations in the field dimensions of the existing facilities.
- K. Removal of Potable Water Pipe Sections to be Abandoned.
1. Existing potable water pipe to be abandoned shall be removed. Excavate and remove existing sections of potable water pipe. Properly dispose of removal debris offsite. Backfill abandoned trenched with Structural Fill in accordance with Section 31 23 33 Trenching and Backfilling.
 2. Any remaining abandoned piping shall be plugged per WSDOT Standard Specifications 7-08.3(4).

3.05 TESTING AND DISINFECTION

- A. See Piping Systems 33 30 00.

3.06 CONNECTION TO EXISTING SYSTEM

- A. Only City staff shall operate the isolation valves on the existing system.
- B. Contractor shall provide 48-hour written notice to customers and the Owner for water shut-off. Notification shall be by means of Contractor providing a door hanger at each residence or place of business to which service will be disrupted. The Owner will provide Contractor with the required pre-printed door hangers. It will be the responsibility of the Contractor to plan for, distribute, and fill-in the specific temporary service shut-down information which shall include, at a minimum, the proposed date and time of service disconnection.

- C. Any support provided by the Owner's staff shall be subject to preemption by emergency operations including, but not limited to, power outages and water main breaks.

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

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

PART 1. GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to following:
 - 1. Installation of new public storm sewer pipes as shown on the Plans.
 - 2. Stormwater collected
 - 3. Drainage for retaining walls.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
 - 1. Section 31 23 33 Trench Excavation and Backfill
 - 2. Section 31 32 11 Soil Surface Erosion Control
 - 3. Section 33 05 00 Common Works Results for Utilities

1.03 REFERENCES

- A. WSDOT Standard Specifications for Road, Bridge and Municipal Construction, latest edition.
- B. WSDOT Standard Plans for Road, Bridge and Municipal Construction, most recent edition.
- C. Washington State Department of Ecology's August 2012 Stormwater Management Manual for Western Washington, as amended in 2014.

1.04 SUBMITTALS

- A. Submit in accordance with Sections 01 33 00.
 - 1. Storm drain piping & accessories with product installation literature.

1.05 QUALITY ASSURANCE

- A. Manufacturer/Installer shall be a Specialist.
- B. Regulatory Requirements - See Section 01 41 00.

PART 2. PRODUCTS

2.01 GENERAL

- A. Comply with "Quality Assurance" provisions, "References," and Specifications. Where these may be in conflict, the more stringent requirements govern.

2.02 MATERIALS

- A. Storm Sewer Pipe
 - 1. Pipe used for storm sewers and slotted pipe shall be double walled (corrugated exterior and smooth interior) polyethylene meeting the requirements of WSDOT Standard Specification 9-05.20 - Corrugated Polyethylene Storm Sewer Pipe.

Pipe shall be manufactured by Advanced Drainage Systems, Inc. (model N12), Hancor, Inc. (model HiQ), or engineer approved equal.

2. For storm pipes will less than 18 inches (1.5 feet) of cover, the material shall be ductile iron, which shall comply with WSDOT Standard Specifications 9-05.13 Ductile Iron Sewer Pipe.
 3. Couplings for polyethylene storm sewer pipe shall be classified as soil tight.
- B. Bedding & Backfill. Bedding and backfill materials shall be per Section 31 23 33 – Trenching and Backfilling. Controlled Density Fill (CDF) shall be lean concrete per WSDOT 6-02.3(2)D.

PART 3. EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.02 INSTALLATION

- A. Install in accordance with “Quality Assurance” provisions, “References,” Specifications, and Manufacturer’s directions. Where these may be in conflict, the more stringent requirements govern.
- B. Line and Grade.
1. Survey line and grade shall be established prior to laying pipe per Standard Specification 7-08.3(2)A. Contractor to provide construction layout staking.
 2. In areas between survey stakes, transfer line and grade from the Plans to the storm line trench and maintain said line and grade using construction practices in conformance with established industry standards.
- C. Handling, Storage and Cutting of Pipe.
1. Material shall be stored in such a manner to prevent the pipe from bowing or otherwise being damaged.
 2. Saw cut pipe to leave a smooth end at right angles to the pipe axis. Prior to joining pipe, cut ends shall be de-burred, beveled and in accordance with the type of joint to be made.
- D. Pipe Installation
1. Storm sewer pipe shall be constructed in accordance with WSDOT Standard Specification 7-08 - General Pipe Installation Requirements.
 2. Pipe shall be installed on a well bedded, prepared foundation throughout its length per Section 31 23 33 - Trenching and Backfilling. Grade the bottom of the trench by hand, if necessary, to the line and grade to which the pipe is to be laid, with proper allowance for pipe thickness and for bedding material.
 3. The pipe shall be uniformly bedded under and around the entire length of the barrel. The bedding shall be dug out to accommodate pipe bells and prevent the joints from supporting excess weight.

4. Take precautions to prevent water from entering the trench during excavation. Do not lay pipe when, in the opinion of the Owner, trench conditions are unsuitable.
 5. Prevent excavated or other foreign material from entering the pipe during the laying operation. When laying operations are not in progress, at the close of the day's work, or when labor is absent from the job, close and block all open pipe ends to prevent entry of foreign material or creep of the joints.
 6. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.
 7. In areas where pipe cover is less than one foot, controlled density fill (CDF) shall be used to encase pipe. The pipe shall have at least one foot of CDF below bottom of pipe and one foot of CDF on either side of pipe, measured from the outer wall of the pipe. CDF shall be used to cover the pipe, bringing it to grade.
- E. Footing Drains.
1. Construct footing drain trenches, line with filter fabric, bed perforated pipe in 12" minimum surrounding thickness of drain rock specified above. Establish elevations and grades of footing drains so as to permit gravity drainage to the onsite tight line storm sewer system.
- F. Building Roof Drains and Downspouts.
1. Tight-line roof drains and downspouts to tie into adjacent storm drain piping. Maintain positive slopes to storm drain piping tie-in and 12" minimum cover.
- G. Surface Drainage.
1. During construction, grade, drain, and maintain work site so as to prevent unnecessary construction delays due to ponding. Protect existing drainage structures and adjacent properties from sedimentation, sediment runoff, and damaging drainage velocities.
 2. Provide proper coordination of site grading, landscaping, and curb and sidewalk construction to assure positive drainage of entire site with no ponding, and all surface stormwater is directed away from the building.

3.03 ADJUSTING, CLEANING, AND REPLACEMENT

- A. Make any adjustments as required.
- B. Clean: Leave installations clean; premises free from residue of work of this section.

3.04 BACKFILL AND DRAINAGE FOR RETAINING WALLS.

- A. Backfill retaining wall and landscape walls per WSDOT Standard Plan D-4. Installed underdrain lines and tight line to storm drainage structures as shown on plans.

END OF SECTION

SECTION 34 00 00 – TRAFFIC MAINTENANCE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Description of Work: The work covered by this section consists of all temporary traffic control measures, including preparation/submittal of traffic control plans and implementation of approved traffic control measures, such as flagging, construction signs, traffic barricades, pedestrian barricades, steel plates for trench protection, temporary ply-wood pedestrian ramps, etc. All work is to be in compliance with Washington State DOT Standard Specifications, Section 1-10 Temporary Traffic Control.

1.02 QUALITY ASSURANCE

- A. The Owner/Engineer will monitor and request adjustments to Traffic Maintenance on an as-needed basis throughout the project.

1.03 JOB CONDITIONS

- A. Existing Conditions:
 - 1. The Contractor shall examine the site before commencing work and shall make his own deductions and conclusions as to the nature of materials to be encountered and difficulties anticipated.

PART 2 - PRODUCTS

2.01 MATERIAL.

Material shall meet the requirements of WSDOT 1-10.1(1) Materials.

PART 3 - EXECUTION

3.01 GENERAL

- A. Submit Traffic Control Plans to the Engineer for approval, prior to starting work.
- B. Access shall be maintained to private property at all times. When construction activities require that this access be temporarily interrupted, the Contractor shall:
 - a. Notify the property Owners individually.
 - b. Restrict access for 2 hours maximum unless the property owner's written permission is received and transmitted to the Engineer.

SECTION 34 00 00 – TRAFFIC MAINTENANCE

- C. The Traffic Control Supervisor shall be certified by one of the following:
- a. The Northwest Laborers-Employers Training Trust
27055 Ohio Ave.
Kingston, WA 98346
360-297-3035
 - b. Evergreen Safety Council
401 Pontius Ave. N.
Seattle, WA 98109
800-521-0778 or 206-382-4090
 - c. Or approved equal.
- D. Completely barricade all open trenches or disturbed areas and adequately sign such areas for pedestrians and traffic. All disturbed areas must be completely barricaded by cones, barricades, and warning tape prior to the end of shift. Prior to the end of shift each area must be reviewed by the Owner's Representative for approval prior to vacating the site.

END OF SECTION

SECTION 43 25 00 – SUBMERSIBLE WELL PUMP – TEMPORARY INSTALLATION

PART 1. GENERAL

1.01 DESCRIPTION

- A. This section covers work by the Contractor to furnish, install, and make ready for operation one (1) Submersible Well Water Pump for temporary operation at Ferndale Shop Well No. 2 for potable water applications as shown on the plans and described herein. It is expected that this temporary well pump will be used for approximately one year, then will be replaced with a larger and deeper well pump as the permanent installation. This project does not include the furnishing and installation of the larger permanent well pump; however, Contractor is to confirm that temporary pump is configured so that the proposed 200 HP permanent pump assembly can be easily installed & connected when City is ready.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with WSDOT Division 1, GENERAL REQUIREMENTS. In addition, the following specific information shall be provided:
1. Pump:
 - a. Descriptive literature and catalog cuts.
 - b. Certified performance curves with pump and system operating points plotted. Pump input horsepower and pump field efficiency over the full capacity range of the pump. This needs to include VFD curves (30 Hz to 60 Hz).
 - c. Certified drawings of proposed equipment including elevation drawings showing pump, driving equipment and couplings, frame, pump sectional drawing with list of parts and materials, and separate driver drawings and data.
 - d. Minimum submergence required over suction inlet, total pump downthrust, bowl, impeller, and motor dimensions, weight of pump and motor assembly with threaded column.
 - e. See Section 01 33 00 for specific requirements.
 2. Motor:
 - a. Descriptive literature and catalog cuts.
 - b. Documentation that motor is 480 volt, 3 phase, 60 Hz, and rated for use with variable frequency drive (VFD). In addition, seal fail contacts and high temp contacts within the motor are to be included and wired from motor throughout pump cable, so that these contacts can be connected to the control panel (to monitor and alarm these conditions).
 - c. See Section 01 33 00 for specific requirements.

SECTION 43 25 00 – SUBMERSIBLE WELL PUMP – TEMPORARY INSTALLATION

3. Operation and Maintenance Data:
 - a. See Section 01 33 00 for specific requirements.

1.03 MANUFACTURER'S SERVICES

- A. A qualified representative of the manufacturer shall be present at the jobsite for the minimum man-days listed for the service hereinunder, travel time excluded:
 1. 2 full working days for startup, checkout, testing, and on-site training of the water pump and motor.

PART 2. PRODUCTS

2.01 MATERIALS

- A. Shop Well #2 Water Pump Assembly
 1. Furnish and deliver surface discharge, submersible well pump, Grundfos 475S250-3-A with 30 HP motor, or approved equal, for installation in a municipal drinking water well.

2.02 OPERATING CONDITIONS

- A. The Submersible Deep Well Turbine Water Pump must be able to meet the following operating points considering a pressure sustaining valve to provide additional head, if needed:

	Design Capacity (USGPM)	Design Total Dynamic Head (ft)
Design Conditions	425 USGPM	180 ft TDH

Size of Well (inside diameter):	10 inches
Depth of Well:	1,000 ft
Pump Bowl Setting (below ground surface):	167 ft
Water Temperature:	16°C
Water Chemistry – Manganese Concentration:	0.089 mg/L
Water Chemistry – Chloride Concentration:	1002 mg/L
Water Chemistry – Conductivity:	3710 µS/cm
Water Chemistry – TDS Concentration:	1962 mg/L
Maximum Rated Speed:	3450 RPM
Minimum Acceptance Best Efficiency:	75%

- B. Unless otherwise stated herein, the pump shall in all respects conform to the American National Standard ANSI/AWWA-E101 for “Vertical Turbine Pumps, Submersible Type” and shall comply with all local and state sanitary and safety regulations. Materials in contact with water are to be suitable for potable water applications, corrosion resistant, and NSF 61 certified.

SECTION 43 25 00 – SUBMERSIBLE WELL PUMP – TEMPORARY INSTALLATION

2.03 PUMP BOWL ASSEMBLY

- A. The head-capacity curve shall have a steady rise in head from maximum to minimum flow within the published operating region. The shut-off head shall be a minimum of 20% higher than the head at the best efficiency point.
- B. All pump bearings shall be lubricated by the pumped liquid.
- C. The pump shall be suitable for installation vertically discharging the flow.
- D. The pump (including cable guard) shall be suitable for use in a well-casing of the same nominal diameter.
- E. The pump shall be suitable for use in clean groundwater up to 104 deg F.
- F. There shall be a check valve integrally designed into the pump discharge housing.
- G. The pump shall have integrated protection against upthrust.
- H. The pumping downthrust shall be absorbed by the motor thrust bearing.
- I. The pump impellers shall be secured directly to the smooth pump shaft by means of a split-cone and nut design
- J. Each impeller shall be fitted with a seal ring around its eye or skirt to prevent hydraulic losses
- K. A strainer shall be included as part of the suction inlet assembly.
- L. The discharge shall have internal NPT connections.
- M. Pump coupling must be friction-welded to shaft
- N. Pump Construction:
 - 1. Check valve, check valve housing: 304 Stainless Steel
 - 2. Check valve seat NBR/316 Stainless Steel
 - 3. Impellers, split-cone/nuts, diffuser chambers: 304 Stainless Steel
 - 4. Impeller seal rings: NBR/PPS
 - 5. Seal ring support: 304 Stainless Steel
 - 6. Intermediate bearings NBR
 - 7. Suction interconnector, inlet screen 304 Stainless Steel
 - 8. Shaft, priming inducer 431 Stainless Steel
 - 9. Coupling 316/329 Stainless Steel**
 - 10. Straps, cable guard 304 Stainless Steel
 - 11. Upthrust disc: Carbon/Graphite
 - 12. Upthrust stop washer 304 Stainless Steel
 - 13. 8" motor adapter plate (if required) 304 Stainless Steel
 - 14. Sleeve (if required), sleeve flange (if required) 316 Stainless Steel

SECTION 43 25 00 – SUBMERSIBLE WELL PUMP – TEMPORARY INSTALLATION

- O. Pump shall be coupled to motor by same manufacturer.
- P. All pump parts must be available for purchase individually or in kits from the manufacturer.

2.04 SURFACE PLATE

- A. The surface plate shall be made of stainless steel. It shall rigidly support the total weight of the future permanent installation motor, bowl assembly, column pipe, cable and column of water: approximately 36,000 lbs. The cable outlet shall be designed to prevent entry of foreign matter into the well and shall be equipped with a cable seal.

2.05 DROP PIPE

- A. The drop pipe, threaded and coupled, shall conform to American Standard tapered pipe thread specifications. One additional stick of pipe shall be installed to connect to the existing drop pipe. The pipe shall have an inside diameter of 4 inches, and shall be galvanized steel. Pipe is to be rated for a working pressure condition of 300 psi (minimum). Fittings shall be provided and installed as necessary to connect the 4-inch diameter drop pipe with the 6-inch diameter elbow at the surface plate, as shown in the plans.

2.06 SUBMERSIBLE CABLE

- A. The submersible cable shall be sized to limit the voltage drop to 5% at the motor's terminals. Each conductor shall be jacketed or the conductors may be included in a single jacketed assembly. The conductor insulation shall be water and oil resistant, suitable for continuous immersion.
- B. The length of the cable to be furnished shall be the sum of total pump setting, including bowl unit, plus one foot for each 50 feet of setting to compensate for possible twist or sag during installation, plus ten (10) feet to extend from the surface plate to the pumping plant panel. The cable will be suitably supported from the column. All cable fittings and terminals shall be water tight at the pressure encountered in the application.

2.07 MOTOR

- A. Motors shall be squirrel-cage induction motor designed for continuous underwater operation in conformance to NEMA standards.
- B. Motor nameplate information shall be laser-engraved on outer stator housing surface. Nameplate shall have, as a minimum, all information as described in NEMA Standard MG 1-20.40.1.
- C. The motor shall have a Kingsbury-type or Michell thrust bearing capable of carrying the maximum pump thrust loads.
- D. The motor shall be water-filled for cooling and lubrication. Glycerol and water with propylene-glycol and preservatives is permissible. No oils or grease or other hydrocarbon lubrication shall be used.
- E. A shaft seal shall be provided to ensure the internal motor fluid is not mixed with the pumped fluid and to protect cooling fluid from system abrasives.

SECTION 43 25 00 – SUBMERSIBLE WELL PUMP – TEMPORARY INSTALLATION

- F. A flexible diaphragm shall be provided to permit expansion and contraction of the internal motor fluid when the motor heats and cools during operation.
- G. The motor shall be suitable for vertical installation.
- H. The motor shall be designed such that, if the fluid temperature is less than 86 deg F, the flow velocity over the motor required for cooling does not exceed 0.5 ft/s.
- I. Three phase motors shall be suitable for use with a variable frequency drive available through motor manufacturer.
- J. Motor shall be coupled to pump of same manufacturer.
- K. Motor shall be provided with High Temperature Signal.
- L. Motor Construction:
 - 1. Stator sleeve EN 1.4301
 - 2. Stator flange EN 1.4308
 - 3. Shaft with rotor EN 1.4462
 - 4. Thrust bearing, stationary EN 1.4125
 - 5. Thrust ring, rotating Graphite
 - 6. Thrust ring support EN 1.4016
 - 7. Diaphragm NBR
 - 8. End cover EN 1.4308
 - 9. Thrust bearing housing EN 1.4308
 - 10. Shaft seal housing EN 1.4308
 - 11. Shaft seal, stationary Ceramics
 - 12. Shaft seal, rotating Carbon
 - 13. Motor liquid SML-3
- M. Motor shall meet the following:
 - 1. Flange: 5.5 inches OD (max)
 - 2. Degree of Protection: IP68
 - 3. Voltage Tolerance: +6% / -10%
 - 4. Max Ambient Pressure: 870.23 psi

2.08 WATER LEVEL INDICATOR ASSEMBLY

- A. A 1" tube for a submersible level transducer, and a 1" tube for a portable sounding tube shall be furnished of sufficient length to extend from the surface to the top of the bowl assembly. Bottom end of each tube is to have cap and be located 6-inches above the top of the bowl assembly. The lowest 100-foot section of tube is to be perforated PVC to allow water to enter and exit tube. Both tubes shall be plastic tubing (schedule 40 PVC),

SECTION 43 25 00 – SUBMERSIBLE WELL PUMP – TEMPORARY INSTALLATION

and will penetrate the well head plate above the top of the well casing, as shown in the Drawings. Each section of tubing is to be securely attached to the drop pipe with ties compliant with NSF 61 certifications.

2.09 CHECK VALVE

- A. The pump assembly shall include a check valve to prevent water from backflowing through the pump.

PART 3. EXECUTION

3.01 INSTALLATION

- A. The installation of the Shop Well #2 pump shall include removal of existing 10 HP pump/motor/drop pipe and handing removed equipment except drop pipe over to the City for storage, installation of new 30 HP Submersible Well Water Pump Assembly, 4-inch drop pipe with two 1-inch PVC conduits, new surface plate, and other miscellaneous work items shown on the plans.
- B. Installation requirements are listed below.
 - 1. Coordinate schedule with City.
 - 2. Confirm date, time requirements, and work plan with team prior to mobilizing on-site.
 - 3. Removal of existing 10 HP pump assembly, including motor, drop pipe, and valving.
 - 4. Handing all removed equipment except drop pipe over to the City for storage. Coordinate hand off location with City. Existing drop pipe to be reused with new 30 HP pump.
 - 5. Installation of new 30 HP Submersible Well Water Pump Assembly with Motor
 - 6. Check alignment of pump and motors after installation.
 - 7. Installation of 4-inch drop pipe, reusing existing drop pipe and adding one additional 20-ft stick of pipe, and two 1-inch PVC conduits.
 - 8. Installation of new surface plate and connections needed to surface seal plate.
 - 9. Installation shall be by qualified personnel.
 - 10. Level and shim surface plate in place before final sealing.
 - 11. Factory representative to check entire pump assembly for satisfactory operation, including confirmation that no vibration issues are detected.

SECTION 43 25 00 – SUBMERSIBLE WELL PUMP – TEMPORARY INSTALLATION

3.02 FACTORY TESTING

- A. The pump shall be tested for performance by the manufacturer as standard prior to shipping. The testing shall demonstrate that the pump can meet the specified operating flow conditions.
- B. Notify the Engineer a minimum of 10 days prior to testing so that the Engineer may witness the tests.
- C. The pump manufacturer shall be capable of providing any of the following tests prior to shipment:
 - 1. Verified Performance Test
 - 2. Witnessed Verified Performance Test

3.03 FIELD TESTING

- A. After installation, all pumps shall be subjected to a field running test under normal operating conditions. Field vibration testing shall be performed in accordance with Hydraulic Institute standard 9.6.4 and shall include, but not be limited to, taking vibration readings perpendicular to the discharge, in-line with the discharge, and vertically above or below the discharge. The field tests shall be conducted in the presence of and as directed by the Owner and Engineer. The field tests shall demonstrate that each pumping unit:
 - 1. Has not been damaged during transportation or installation.
 - 2. Has been properly installed, has no mechanical defects, is in proper alignment, and has been properly connected.
 - 3. Is free of overheating, objectionable vibration, and excessive noise as defined by the Hydraulic Institute Standards.
- B. Any defects in the equipment or failure to meet requirements of the Specification shall be promptly corrected by the Contractor and the field test rerun to demonstrate the adequacy of the adjustments.

3.04 DISINFECTION

- A. Disinfection of Shop Well #2 shall be in accordance with AWWA C654-13.

3.05 PAINTING

- A. All painting shall be in accordance with the Manufacturer's standards.

3.06 ELECTRICAL

- A. All electrical work shall be in accordance with Division 26, ELECTRICAL.

SECTION 43 25 00 – SUBMERSIBLE WELL PUMP – TEMPORARY INSTALLATION

3.07 WARRANTY

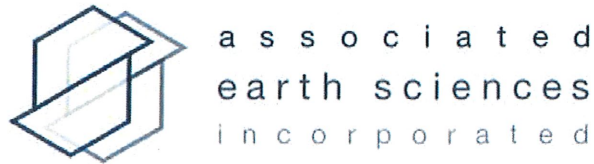
- A. Provide one-year non-prorated warranty for entire pump assembly and motor. Products are to be warranted to be free from defects in material and workmanship. Warranty period is to begin after new pump assembly is installed, satisfactorily tested, training is complete, O&M data transferred to Owner, and all other work items are complete and accepted by Owner.

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

PART 4

REFERENCE DOCUMENTS

APPENDIX A – GEOTECHNICAL REPORT



February 5, 2019
Project No. 170420H001

Wilson Engineering, LLC
805 Dupont Street
Bellingham, Washington 98225

Attention: Jeff Christner

Subject: Geotechnical Letter-Report
Ferndale Shop Well #2
Ferndale, Washington

Dear Mr. Christner:

Associated Earth Sciences, Inc. (AESI) is pleased to present this letter-report providing a summary of our literature review and limited geotechnical engineering study for the new well house at the City of Ferndale Shop Well #2 facility. This letter-report has been prepared for the exclusive use of Wilson Engineering, and their agents, for specific application to this project. Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering practices in effect in this area at the time our letter-report was prepared. No other warranty, express or implied, is made. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner. Furthermore, the recommendations in this letter-report are subject to verification during construction.

INTRODUCTION

We understand the project includes a new structure to house the well pump for the potable water facility. The new building will be a one-story concrete masonry unit (CMU) building with a shallow foundation and outside dimensions of about 13 feet by 22 feet.

The primary purpose of this study was to review existing readily available information and excavate one exploration pit in the location of the structure to provide recommendations for foundation design including:

- A summary of our literature review regarding the anticipated subsurface conditions;
- Site preparation recommendations including temporary and permanent cut slope recommendations;
- Type(s) of suitable foundation(s);
- Allowable foundation soil bearing pressures;
- Seismic design considerations.

SITE AND PROJECT DESCRIPTION

The proposed new well house is located on the north side of the main entrance just off the west side of Legoe Avenue. North of the well house site is a material storage area and to the west of the site is the shop. The immediate vicinity of the building pad location is a gravel surface. The topography is relatively level.

SUBSURFACE EXPLORATION

Our subsurface exploration completed for this project included excavating one exploration pit to a depth of 5 feet located within the proposed footprint of the well house. The conclusions and recommendations presented in this letter-report are based on the exploration completed for this study. The number, location, and depth of the exploration were completed within site and budget constraints.

The exploration pit was excavated with a mini excavator provided by the City staff. The exploration pit permitted direct, visual observation of subsurface conditions. Materials encountered in the exploration pit were studied and classified in the field by an engineering geologist from our firm. The exploration pit log is summarized below. The exploration pit was backfilled immediately after examination and logging. Selected samples recovered were transported to our laboratory for further visual classification and testing, as necessary. Because of the nature of exploratory work below ground, extrapolation of subsurface conditions is necessary. It should be noted that differing subsurface conditions may sometimes be present due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations beyond the field exploration may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this letter-report and make appropriate changes.

Fill

Fill soils (soils not naturally placed) were encountered for the full depth of the excavation. The fill consisted of medium dense fine sands and silt with minor amounts of organics. Fill thicknesses can vary over short distances and may be deeper than observed in our explorations. The exploration pit is summarized below.

- 0 - 1.5 FT - Slightly moist, brown-gray, dense, silty, sandy GRAVEL. Gravel was fine to coarse with cobbles.
- 1.5 - 2.5 FT - Slightly moist, brown, medium dense, SAND with trace silt. Sand was fine to medium.
- 2.5 - 3.5 FT - Slightly moist, dark gray, firm, SILT, with abundant organics. T-probe = 2" penetration.
- 3.5- 5 FT - Slightly moist, brown, medium dense, SAND. Sand was fine to medium. T-probe 2" penetration.

Geologic Mapping

Review of the regional geologic map (D.J. Easterbrook, *Geologic Map of Western Whatcom County, Washington*, United States Geological Survey [USGS], 1976, scale 1:62,500.) indicates that the area is underlain by Terrace deposits. Terrace deposits consist of well sorted, well stratified sand and gravel deposits along flood plains and beaches. Deposited by late Pleistocene streams and seas. The thickness is as much as 15 feet. The material encountered may be reconstituted Terrace deposits placed as fill.

Hydrology

No groundwater seepages were observed; however, perched groundwater could be encountered during the wet season at the site. Perched water conditions can occur when water becomes trapped or "perched" atop a comparatively impermeable barrier. This water may travel as interflow and typically will follow the ground surface topography. The duration and quantity of interflow seepage will largely depend on the soil grain-size distribution, topography, seasonal precipitation, on- and off-site land usage, and other factors.

CONCLUSIONS AND RECOMMENDATIONS

Introduction

Our exploration pit and document review indicate that, from a geotechnical standpoint, the subject site is suitable for the proposed project. Medium dense to dense fill soils are

anticipated at shallow depths and will provide suitable support for structural fills after overexcavation, and conventional spread footing building foundations when prepared as noted in the following recommendations. Existing fill should be removed from building areas prior to placing a recompacted structural fill. The following sections provide our recommendations for foundation support.

Site Preparation

Erosion and surface water control should be established around the clearing limits to satisfy local requirements. Once any demolition within the building envelope has been completed, any existing fill should be addressed. Though likely shallow in the location of the proposed building, variation can exist in short distances. We recommend that existing fill be removed from below areas of planned foundations to a minimum depth of 2 feet below the foundation level. Once stripping and removal of existing fill has been completed, the exposed material should be recompacted to a firm and unyielding condition, as determined by an on-site AESI representative. Any soft or yielding areas may require further removal or other measures to provide a more stable surface for fill placement. After recompaction of the exposed ground is tested and approved by the geotechnical engineer, structural fill should be placed to attain desired grades.

In our opinion, stable construction slopes should be the responsibility of the contractor and should be determined during construction. For estimating purposes, temporary, unsupported cut slopes in the lodgement till and fill may be made at a maximum slope of 1H:1V (Horizontal:Vertical). As is typical with earthwork operations, some sloughing and raveling may occur, especially if groundwater seepage is present in the excavation cuts, and cut slopes may have to be adjusted in the field. In addition, WISHA/OSHA regulations should be followed at all times.

A high percentage of fine-grained material within the on-site soils makes them moisture-sensitive and subject to disturbance when wet. The contractor must use care during site preparation and excavation operations so that the underlying soils are not softened. If disturbance occurs, the softened soils should be removed, and the area brought to grade with structural fill.

Structural Fill

After recompaction of the exposed ground is completed and approved by the geotechnical engineer as described above, structural fill should be placed as required to attain desired grades. Structural fill is defined as nonorganic soil, acceptable to the geotechnical engineer, placed in maximum 8-inch loose lifts, with each lift being compacted to 95 percent of the modified Proctor maximum density using *American Society for Testing and Materials*

(ASTM) D-1557 as the standard. The on-site native soils that are free of deleterious materials are suitable for reuse as structural fill provided they are present at a moisture content suitable for achieving the specified compaction.

Soils in which the amount of fine-grained material (smaller than the No. 200 sieve) is greater than approximately 5 percent (measured on the minus No. 4 sieve size) should be considered moisture-sensitive. Use of moisture-sensitive soil in structural fills will, on a practicable basis, be limited to favorable dry weather conditions. The on-site lodgment till contains a relatively high content of silt and is considered moisture-sensitive. Reuse of these soils as structural fill may be difficult and will likely require some moisture-conditioning. In addition, construction equipment traversing the site when the soils are wet can cause considerable disturbance. If structural fill is to be placed during wet weather or if proper compaction cannot be obtained, a select material consisting of a clean, free-draining gravel and/or sand should be used. Free-draining fill consists of non-organic soil with the amount of fine-grained material limited to 5 percent by weight when measured on the minus No. 4 sieve fraction.

A representative from AESI should inspect the stripped subgrade and be present during placement of structural fill to observe the work and perform a representative number of in-place density tests. In this way, the adequacy of the earthwork may be evaluated as filling progresses and any problem areas may be corrected at that time. Our field technicians and engineer are available to aid the owner in developing a suitable monitoring and testing program, such that quality control is adequately provided.

Foundations

Spread footings may be used for foundation support when bearing on medium dense to dense structural fill that has been placed from the overexcavation.

For footings founded directly on suitable soils prepared as described above, we recommend that an allowable bearing pressure of 2,000 pounds per square foot (psf) be used for design purposes, including both dead and live loads. An increase of one-third may be used for short-term wind or seismic loading. Perimeter footings for the proposed building should be buried a minimum of 18 inches into the surrounding soil for frost protection. All footings must penetrate to the prescribed stratum, and no footings should be founded in or above loose, organic soils. All excavations for foundation areas should be observed by a representative from AESI prior to placement of the foundation elements.

Seismic

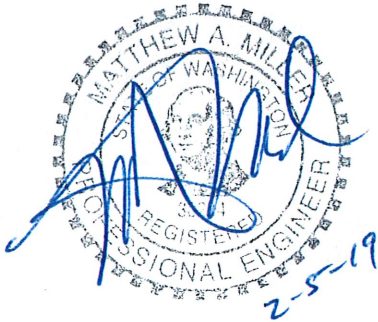
The 2015 *International Building Code* (IBC) assigns a seismic Site Class on the basis of geological conditions prevailing within a depth of 100 feet below the local ground surface. We infer from

near-surface soil observations and from available geologic maps that very dense glacially overridden soils extend beyond this depth. Assuming that our foregoing foundation recommendations are properly implemented, we recommend using Site Class "D" for the new design.

CLOSURE

We appreciate the opportunity to be of service to you on this project. Our recommendations and conclusions were based upon review of readily available information and the results of our exploration. All the recommendations in this report must be field-verified during construction. Should you have any questions regarding this letter-report or other geotechnical aspects of the project, please call us at your earliest convenience.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington



Matthew A. Miller, P.E.
Principal Engineer

APPENDIX B – WASHINGTON STATE PREVAILING WAGE RATES

The State of Washington prevailing wage rates applicable for this public works project, which is located in Whatcom County, may be found at the following website address of the Department of Labor and Industries:

<https://fortress.wa.gov/lni/wagelookup/prvwagelookup.aspx>

Based on the bid submittal deadline for this project, the applicable effective date for prevailing wages for this project is January 30, 2020. A copy of the applicable prevailing wage rates are also available for viewing at the office of the Owner, located at:

City of Ferndale 2095 Main Street, Ferndale, WA 98248

Upon request, the Owner will mail a hard copy of the applicable prevailing wages for this project.

APPENDIX C – CITY SCADA/PLC PROGRAMMER SERVICES

Note: Services to be performed as force account work per WSOT 1-09.6 Force Account, 6. For Contractor Markup on Subcontractor's Work. Subcontractor's anticipated total = \$65,000. Calculated markup:

- \$0 to \$25,000 (at 12% markup): \$3,000.00
- \$25,000 to \$65,000 (at 10% markup): \$4,000.00
- Total anticipated markup: \$7,000.00

Bid Item Total = \$65,000.00 (City SCAD/PLC Prog. Services) + \$7,000.00 (markup) = **\$72,000.00**