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SPECIFICATIONS

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 011000 SUMMARY

1.0 DOCUMENTS

1.1 This section forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts of the Contract Documents.

1.2 The Specifications have been divided into approximate trade sections. However, the division of the Specifications into sections shall not operate to define or limit the responsibility of any Subcontractor.

2.0 COORDINATION AND COOPERATION

2.1 The Contractor shall coordinate the work of his Subcontractors with efficient and continuous supervision and be fully aware of the Work requirements including, without limitation, those of the Specifications and Drawings.

2.2 The Contractor is responsible for determining which Subcontractor shall perform Work. Differences in interpretation of the Specifications or Drawings as to which Subcontractor shall perform certain Work shall not be grounds for claims for extras.

2.3 The Contractor shall coordinate the use of Products and Construction Equipment, including cranes, hoists, ladders and scaffolds, and access to the Place of the Work, with the work of Subcontractors. The cost of use of Construction Equipment and Products by Subcontractors shall be governed by the agreements between the Contractor and the Subcontractors.

3.0 DAILY RECORD

3.1 From the day of commencement of the Work, the Contractor shall maintain a careful daily record of the progress of the Work on his standard record form, with applicable trades listed. This record shall be open to the Regional District’s inspections at all reasonable times. A copy of the record shall be turned over to the Regional District at weekly intervals.

3.2 Contractor's diary shall record all pertinent data such as:

1. Daily weather conditions including maximum and minimum temperatures.
2. Commencement, progress and completion of various portions of the Work.
3. Dates of visits or inspections by government authorities, inspectors, and any other visitors to the Site.
4. Record of work force employed, and work performed thereby.

4.0 DISRUPTION NOTIFICATIONS

4.1 Public Notifications, the Contractor shall be responsible for public relations including, but not limited to:

1. A minimum of 14 days prior to commencing work, provide written notices, pre-approved by the Regional District, to area residents introducing the project including information about expected occurrences of detours and/or access restrictions.
2. A minimum of 96 hours prior to construction, provide written notification, pre-approved by the Regional District, to the affected residents of any disruption to access and/or other service inconveniences.
3. A minimum of 96 hours prior provide written notification, pre-approved by the Regional District, to affected residents of impending water service interruption. Affected consumers to be identified in conjunction with the Regional District. No services shall be interrupted for more than eight (8) hours in any one (1) day. If necessary, then temporary service will be provided.

4.2 Operation of any existing water valves to be completed by the Regional District only.

4.3 Emergency Services Notifications

1. A minimum of 48 hours prior, provide written notice to Emergency Services of any water system shutdown or inactivation of hydrants.

5.0 PERMITS AND FEES

5.1 The Contractor shall obtain and pay for the following anticipated permits and licenses required for the Work:

1. Ministry of Transportation and Infrastructure Traffic Control Permits, Technical Safety BC Electrical Permit and all other required permits and inspections not listed will be the responsibility of the Contractor to procure.

5.2 The Regional District will obtain the following permits:

1. Ministry of Transportation and Infrastructure Permit to Construct, Use, and Maintain Works Within the Right-of-Way.
2. Vancouver Coastal Health.
3. Archeology.

5.3 The Contractor shall conform to the codes, ordinances, regulations, terms and conditions and orders of all authorities having jurisdiction over the performance of the Work. Should conflicts arise, the Contractor shall forthwith request clarification from the Regional District.

6.0 ARCHEOLOGICAL MONITORING

6.1 If during the course of the Works an archaeological site is identified, work will cease, and the Heritage Conservation Act will be adhered to. Next steps may include:

1. Permitting and First Nation Consultation –Consultation with the Shíshálh Nation and Sḵwx̱wú7mesh Úxwumixw (Squamish Nation) is necessary to facilitate fieldwork. Work within Shíshálh Nation and Sḵwx̱wú7mesh Traditional Territory requires a Shíshálh Nation or Sḵwx̱wú7mesh Úxwumixw Heritage Inspection Permit and a minimum 30-day notice prior to commencement. As part of consultation, In Situ will facilitate the Shíshálh Nation and/or Squamish Nation's participation in fieldwork, as needed.
2. Monitoring – An archaeological crew will be on site to monitor all ground-disturbing works until such time that the potential for encountering archaeological materials is eliminated. The standard crew complement will consist of one (1) archaeologist and one (1) archaeological technician. Additional crew may be added as needed to accommodate the workplan and archaeological observations, or if multiple project components require excavation at once. The area in purple below does not require archeological inspection due to previous inspections being completed.
3. Trenching – The excavator operator will communicate fully with the archaeologist on site prior to and during any excavation activities to ensure that a plan is in place and is understood by all parties. Where cultural (archaeological) materials are encountered, excavation will be limited to 10 cm lifts or at the discretion of the Regional District. The archaeologist will direct the relocation of material for screening. Where non-archaeological sediments are encountered (e.g., pavement, construction fill, culturally sterile clays, sand, or till), excavation may proceed at a pace suitable to the Contractor.
4. Trench excavation will be monitored and, where suspected cultural materials are encountered, the archaeologist will direct the excavator operator to pause until the nature of the sediments can be confirmed as disturbed, intact, or non-archaeological. Once identified, excavation may proceed according to the procedures below. Non-archaeological sediment should be kept separate from the cultural sediment stockpile(s) during excavation.

5. Once sediments are stockpiled, the archaeologist will facilitate the continuation of the trenching. Sample screening will be conducted separately from monitoring. Non-archaeological sediments may be directly loaded into a truck and removed from the site.
6. Treatment of Disturbed Archaeological Materials – Sediments identified by the archaeologist as disturbed archaeological material may be excavated in 10 cm lifts and set aside for sample screening. A 25% sample of this material will be screened.
7. Treatment of Intact Archaeological Materials – Where intact deposits are identified; the archaeologist will direct the excavator operator in removing sediment along the trench to expose the top of the intact layer and determine the extent of the intact deposit. It is expected that one (1) evaluation will be conducted per five (5) m3 of intact archaeological deposits. The archaeologist will decide when/where evaluative units will be placed in consultation with Shíshálh Nation and Sḵwx̱wú7mesh Úxwumixw. Trenching or other work may continue elsewhere while the evaluative unit is excavated (typically eight (8) to 12 hours of hand excavation). The archaeologist will determine where the sediments can continue to be excavated and stockpiled. Once the evaluative unit is complete, the mechanical excavation can continue at that location.
8. An evaluative unit typically measures 1 m x 1 m square, and is hand excavated until the termination of archaeological deposits is reached, or to the depth required by the development, whichever comes first. Intact archaeological sediments will be 100% screened for discretionary artifact collection.

7.0 WORK AREA

7.1 The Work and the operation of vehicles and machinery, storage of equipment, materials and/or supplies will be contained within the Place of the Work.

7.2 Streets beyond the limits of the work and other construction areas shall be kept clean.

7.3 The Contractor is responsible for dust control within the Place of the Work and roadways beyond the limits of the Place of the Work that have been affected during construction. While performing the Work the Contractor shall control dust originating from the Work and shall take immediate corrective action if directed by the Regional District.

7.4 The Contractor shall provide for efficient drainage of all sections of the work during all stages of construction at his own expense. The Contractor will be held responsible for all damage which may be caused through his failure to provide proper drainage facilities. The Contractor shall restore any existing drainage works which are disturbed as a result of his construction activities.

7.5 The Contractor will give the Regional District at least 48 hours' notice in writing before requiring any baselines or benchmarks in connection with the work. The Contractor shall clearly state in such notice the exact location where levels, lines, or stakes are required. The Contractor will satisfy himself before commencing any work as to the meaning and correctness of all stakes and marks, and no claim will be entertained by the Regional District for or on account of any alleged inaccuracies, unless the Contractor notified the Regional District of such inaccuracies in writing before commencing the work.

7.6 The Contractor will be held responsible for the preservation of all stakes and marks in their proper positions, and where any of them are disturbed, lost or destroyed, it shall at once notify the Regional District in writing, and all expenses incurred in replacing such stakes or marks will be billed against the Contractor and if not paid by the Contractor will be deducted from any monies due the Contractor under the Contract.

7.7 All stakes and marks set will not in every case represent all the grades, levels, lines, angles or surfaces in the finished work and in this regard the Contractor shall ensure that such stakes and marks are read correctly and used in a manner consistent with the plans, details, specifications and directions of the Regional District. Should the Contractor discover or suspect any errors in stakes, lines, and grades which have been established for its use, the Contractor shall at once discontinue the work until such suspicions are investigated and any errors or misunderstanding rectified, but no claims shall be made or allowed on this account, or because of any resulting delay.

7.8 The Contractor shall assume full responsibility for alignment, elevations, and dimensions of each and all parts of the Work, regardless of whether the Contractor's layout work has been checked by the Regional District.

7.9 The Contractor shall furnish the Regional District or any of his assistants with all reasonable help which may be required at any time in driving stakes or laying out the work. The Contractor will receive no additional compensation for this.

7.10 In order to satisfy the Regional District that the Contractor has addressed concerns regarding traffic control and safety it will be required to submit a sketch indicating its proposed method of barricades and/or signage for each of the work sites included in the Contract. This information shall be available for review and approval by the Regional District at the Contract pre-construction meeting.

7.11 Emergency access and pedestrian access to all properties shall be maintained at all times. Access for local traffic shall be maintained at all times. Dusty materials shall be transported in covered haulage vehicles. Wet materials shall be transported in suitable watertight haulage vehicles. The Contractor will ensure there is not any tracking of mud or debris along any traveled roadways and will be responsible for street sweeping to ensure the paved roadway is clear of any debris from the Site.

7.12 The Contractor shall be responsible to ensure there is not any tracking of mud or debris on the roadways at all times.

8.0 CONSTRUCTION SCHEDULE

8.1 To co-ordinate the work, the Contractor or person(s) authorized to act for the Contractor will attend regular meetings with the Regional District or his representative during the period over which the work under the Contract is carried out, at a time and place to be decided by the Regional District.

8.2 The Contractor will provide a comprehensive Project Schedule depicting all the work activities and durations, critical path schedule, lead and lag times for all procured material. The schedule will be updated at least monthly or more often as required by the Regional District.

8.3 The Contractor shall commence the Work within five (5) working days after receiving Notice to Proceed from the Regional District.

9.0 PRECONSTRUCTION MEETING

9.1 The Contractor shall attend a meeting with the Subcontractors, field inspectors, supervisors and the Regional District to discuss and resolve administrative procedures and responsibilities, and scheduling prior to commencing the Work.

9.2 Items to be discussed shall include, but shall not necessarily be limited to the following:

1. Review of the Scope of Work.
2. Work Restrictions.
3. Emergency Contact List.
4. Chain of Command.

5. Submittal Discussion.
6. Construction Changes and Procedures.
7. Inadvertent Discovery Procedures.
8. Public Notification.
9. Coordination with Regional District's Operational Staff.
10. Work Disputes and Resolution.
11. Progress Pay Estimates and Retainage.
12. Commissioning Procedures and Checklist.
13. Operation and Maintenance Manuals.
14. Record Drawings.
15. Substantial Completion.
16. Project Closeout Discussion.
17. Other.

9.3 Confirmation of authorized representatives of the Regional District, consultants working behalf of the Regional District and the Contractor and the name of the Contractor's Construction Safety Officer.

9.4 Construction Schedule.

9.5 Site security.

9.6 Contractor Emergency Procedures and Notifications.

9.7 Project Substantial completion, physical completion, holdbacks, holdback release, and project acceptance.

9.8 Monthly progress payment requests, administrative procedures and holdbacks.

10.0 PROGRESS MEETINGS

10.1 The Contractor shall hold progress meetings every week with the Regional District's in person or via TEAMS/Zoom calls throughout the duration of the Work.

10.2 The Contractor and Subcontractors involved in the Work shall attend all the weekly progress meetings.

10.3 The Regional District will record minutes of weekly progress meetings and circulate same to attending parties within three (3) days of meeting.

11.0 CONSTRUCTION SAFETY

11.1 The Contractor shall be considered the prime Contractor until such time as substantial completion is issued on the project.

11.2 The Contractor shall comply with the Workers' Compensation Prevention Regulations of British Columbia (latest edition) and provide all necessary safety requirements as prescribed by such regulations.

12.0 SECURITY

12.1 The Contractor shall be responsible for security of the Work and at the Place of the Work. The Contractor shall secure the work area and materials by installation of a minimum 6 foot-high metal fence fully enclosing the work perimeter at the worksite prior to commencing the Work and until the Work is complete and approved by the Regional District.

12.2 The Contractor and his Subcontractors shall make their own arrangements to ensure the security of their own equipment and materials.

12.3 The Regional District, and/or their respective representatives will not be liable for any loss or damage to materials, equipment or other property of the Contractor, unless caused by their negligence.

13.0 CONCEALED OR UNKNOWN CONDITIONS

13.1 Before commencing any Work at the Place of the Work, the Contractor shall be responsible to locate in three (3) dimensions all underground utilities and structures indicated on the Contract Documents as being at the Place of Work. The Contractor shall also be responsible to consult with all utility providers that provide electricity, communication, gas, or other utility services in the area of the Place of Work, to locate in three (3) dimensions all underground utilities for which they have records. The Contractor shall also locate in three (3) dimensions any other utilities or underground structures that are reasonably apparent in an inspection of the Place of the Work.

14.0 OPERATING AND MAINTENANCE MANUALS

14.1 Upon Substantial Performance of the Work, the Contractor shall compile, generate and submit to the Regional District two (2) copies of operational manuals for the newly installed equipment and appurtenances in a three (3)ring binder, with each chapter clearly labeled, containing pertinent information on maintenance, inspection, and emergency procedures, receipts, test reports, warranties, equipment catalogue sheet of all equipment and finish schedules, and other Work information. The Contractor shall also provide two (2) pdfs of the completed and accepted operational manuals to the Regional District.

15.0 RECORD DRAWINGS

15.1 The Contractor shall keep one (1) set of current white hard copy prints of all Drawings and all addenda, revisions, clarifications, change orders, and reviewed Shop Drawings in the site office; and have always them available for inspection by the Regional District. Payments will not be made to the contactor if Record Drawings are incomplete and lacking in detail.

15.2 At completion of the Work, the Contractor shall employ competent personnel to transfer all deviations, including those required by addenda, revisions, clarifications, Shop Drawings, change directive and change order, to a set of white prints. Each as- built print shall bear the Contractor's identification, the date of record and the notation, “We hereby certify that these drawings represent the work Record Drawings'.” The Contractor's signature shall be placed below that notation.

15.3 The Regional District shall transcribe the “Record Drawings” and create and full set of “Record Drawings” depicting the work completed.

16.0 SUBSTANTIAL PERFORMANCE

16.1 Prior to or at the time of applying for a review to establish Substantial Performance of Work, the Contractor shall submit to the Regional District the following completed items:

1. Letters of Assurance from the Contractor, attesting to the successful installation, startup testing, and commissioning of the submersible pump and motor assembly and pitless adaptor assembly. Reports of pipes and mechanical instruments pressure testing, chlorination and bacteriological testing.
2. All required, completed and signed off of the Manufacturer’s inspections, certifications, guarantees, warranties as specified in the Contract Documents.
3. All maintenance manuals, operating instructions, maintenance and operating tools, replacement parts or materials as specified in the Contract Documents.
4. Certificates of completion issued by all permit issuing authorities indicating approval of all installations requiring permits.
5. Certificates issued by all testing, commissioning, cleaning, inspection authorities and associations as specified in the Contract Documents.
6. All Record Drawings and as-installed documents in the form specified in the Contract Documents.

17.0 PROJECT COMMISSIONING

17.1 The Contractor shall:

1. Prior to final inspection and payment, the Contractor shall coordinate, execute and demonstrate operation of each system component, including the installed submersible pump and motor, pitless adaptor unit, the flow control valve and the hypochlorite system and reconnection to the satisfaction of the Regional District engineer and shall instruct personnel in operation, adjustment, and maintenance of equipment and systems, using data provided by operation and maintenance manuals.

17.2 The Contractor will coordinate, execute, and successfully complete the startup testing and commissioning of the installed pump and motor assembly, including the hypochlorite system, the electronic interface flow metering valve, and demonstrate for a duration of 48 hours a successful, fault free and uninterrupted operation of the newly installed pump and motor and pitless adaptor assembly. The Contractor will submit a commissioning program and checklist at least 10 calendar days in advance of the requested start up commissioning including checklists and verifications to be conducted during the continuous 48-hour test. The Contractor shall promptly correct deficiencies and defects identified by the Regional District. Should any part of the commission fail, the startup 48-hour test shall re-commence at time zero and will run for 48 hours continuously without fault to be considered a successful commission. During commissioning, the Contractor shall have all pertinent field personnel, and all the equipment representatives, including the Professional Geoscientist for the beginning of the start-up testing and remain on site throughout the day during the start-up commissioning and then be available the remainder of the 48 hours on the Coast and available to respond to any inadvertent fault(s) to ensure the commissioning can resume. A final commissioning report will be submitted to the Regional District after the successful commissioning for review and comment.

17.3 The Contractor will submit to the Regional District a schedule and a demonstration program at least one (1) week prior to time of demonstration. The Contractor will coordinate and schedule all trades and equipment Manufacturer’s representatives to be on site concurrently the day of start-up and commissioning. For estimating purposes, the Contractor should anticipate a minimum eight (8) hour training session on site for final start up and commissioning including staff training with a question-and-answer period.

17.4 Review maintenance manual contents (operation, maintenance instructions, Record Drawings, spare parts, materials) for completeness.

17.5 Submit required documentation such as statutory declarations, Workers' Compensation certificates, warranties, certificates of approval or acceptance from regulating bodies.

17.6 Attend “end-of-work” testing and break-in or start-up demonstrations.

17.7 Review inspection and testing reports to verify that the findings conform to the intent of the documents and that changes, repairs or replacements have been completed.

17.8 Review condition of equipment that has been used in the course of the Work to ensure turning over at completion in “as new condition” with warranties, dated and certified from time of Substantial Performance of the Work.

17.9 Arrange and coordinate instruction of Regional District's staff in care, maintenance and operation of the pump and electrical systems and finishes by suppliers or Subcontractors. The duration of the instruction shall be a minimum of eight (8) hours of Regional District instruction. Additional time may be required to complete the instruction as determined by the Regional District.

17.10 Provide ongoing review, inspection and attendance to Regional District call back, and maintenance, and repair problems during the warranty periods.

18.0 FIELD SERVICES

18.1 The Contractor shall be responsible for providing survey services to measure and stake the Site and survey services to establish and confirm alignment and grade measurements for the Work prior to excavation and ordering of material. Unless otherwise stipulated in the Contract Documents, all Work is to be laid out by the Contractor. The layout will consist of horizontal and vertical baseline controls.

18.2 The Contractor’s surveyor is to locate, confirm and protect control points prior to starting site work and preserve permanent reference points during construction. No changes or relocations are permitted without prior written notice to the Regional District. Report to the Regional District when a reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations.

18.3 Survey Requirements:

1. Establish at least two (2) additional permanent benchmarks on Site, referenced to established benchmarks by survey control points.
2. Establish lines and levels, locate and lay out, by instrumentation.
3. Stake for excavation, pipe laying, road construction, etc.

4. Provide completed cut sheets and grade sheets to the Regional District at least 24 hours prior to the start of each section.
5. Maintain a complete, accurate log of control and survey work as it progresses. On request of the Contract Administrator, submit documentation to verify accuracy of field work.

18.4 Promptly notify the Regional District in writing if subsurface conditions at the Place of the Work differ materially from those indicated in the Contract Documents, or a reasonable assumption of probable conditions based thereon. After prompt investigation, should the Contract Administrator determine that the conditions do differ materially, instructions will be issued for changes in the Work as provided in the General Conditions.

18.5 The Contractor, upon entering the site for the purpose of beginning Work, shall locate all reference points and take all necessary precautions to prevent their destruction. The Contractor shall be charged with the cost of verifying or replacing any legal survey pins, monuments, or reference stakes damaged during construction operations. If the Contractor requires the removal of any legal survey markers for the Work, the cost of replacement will be borne by the Contractor for reestablishment, and rerecording of the survey pin(s), provided the written consent of the Regional District is first received and the pin has been adequately referenced by a British Columbia Licensed Land Surveyor (BCLS). The Contractor shall provide and pay for a licensed surveyor, all stakes, markers and tools.

END OF SECTION

SECTION 011100 SUMMARY OF WORK

1.0 GENERAL

1.1 Existing Conditions

The existing Chaster Well and Pump Station was constructed in 1970 and consists of a 300 mm steel well casing, which contains inside it, a 250mm, a 200mm, and a 150 mm well casings. Housed within the 150 mm pipe casing is a 150mm dia. 22.37 kW (30HP) 12 stage submersible pump and motor manufactured by Pentair model 6T30-225. The discharge pump column is 100 mm dia. that is connected to the 100 mm distribution system.

The station has an average daily flow rate of approximately of up to 850 – 900 m3/day in the peak season (May to September), at an average pumping rate of 11 L/s (174 gpm) and the well is not usually operated during the fall and winter seasons.

The submersible well motor is out of service due to it becoming overloaded, and burnt out and has been out of commission since August 2024. It is scheduled to be removed prior to commencement of this work.

1.2 Work Covered by Contract Documents – Also see Schedule A, Schedule of Prices

1.2.1 The Work to be completed under this Contract will consist of providing all the labour, equipment and materials required to complete the project. This includes all civil, mechanical, engineering design and electrical improvements. Electrical design is the responsibility of the Contractor along with installation and integration with the Regional District's SCADA system. The scope of work consists of, but is not limited to, the following major work activities:

WELL PUMP AND WELL MOTOR WORKS:

1. Based on the results of the Professional Geoscientist's hydrogeological Report (to be supplied as an amendment), the Contractor is to complete the following:

    a) Supply, installation, integration and commissioning a new 150mm diameter stainless steel submersible vertical multistage pump and motor assembly, complete with all the mechanical and electrical components and fittings, including a flow control valve,

    b) Supply, installation, integration and commissioning a new variable frequency drive system, and all other system components for a complete and fault free operational automated well pumping station. The following model or similar is anticipated: Franklin pump and motor assembly, Model 300 SSI 50 F66 1464 or an approved equivalent to be confirmed by the Contractor's Professional Geoscientist.

2. New pump and motor size and set depth to be verified by the Contractor upon receiving the Hydrogeological well redevelopment report.
3. Services required to be completed by a registered water well driller or pump installer in British Columbia and a Professional Geoscientist (P.Geo.) or approved equivalent:
    a) Complete a 48-hour constant rate pump draw down performance test and interpret the results to demonstrate the performance of the new pump and motor. The Contractor is to provide a pump curve and stamped hydrological report to the Regional District in the form of a submittal for review and concurrence prior to ordering the pump and motor assembly.
    b) In addition to the typical pump curve operational parameters, the following pump parameters must be depicted:
        - Net Pressure Suction Head Available,
        - Net Pressure Suction Head Required,
        - Minimum Continuous Stable Flow (MCSF),
        - Best Efficiency Point (BEP).
    c) Once the new motor and pump assembly is installed and the remaining improvement work is completed, the entire pump station facility, pump and motor assembly and the newly developed well must be successfully commissioned by the Contractor in the successful completion of a 48-hour fault free continuous automated system operation.

CONSTRUCTION WORKS:

1. Removal and disposal of the utility valve vault, slab, and footings.
2. Supply and install the required base, precast valve vault and specified lid as shown on the drawings.
3. Construct site mechanical improvements with the installation of a new accessible vault to house the mechanical pipe appurtenances and flow controller.

ELECTRICAL, MECHANICAL AND CONTROLS WORKS: Where applicable, components to adhere to the Canadian Electrical code (CEC) standards.

1. Complete the electrical design, fabrication and install for all the required electrical wiring and connections to the new motor and pump assembly, including all wiring connections to the motor control center.

2. Design, fabricate, install, integrate and commission a new automated Variable Frequency Drive (VFD), with a DV/DT motor protection filter, motor control system, complete with all the electrical and motor control components fully integrated and functional automated pumping control SCADA motor control system. The design will be provided by a professional engineer procured by the Contractor and SCADA integrator licensed in British Columbia. Stamped and sealed drawings will be submitted for review to the REGIONAL DISTRICT as part of the submittal review process.
3. Installation of an electronic interface flow control metering valve assembly with an electronic flow controller complete with a Supervisory Control and Data Acquisition (SCADA) point of connection device.
4. The Contractor will be responsible for the full engineering, fabrication, supply, installation, testing and commissioning of the new pump and motor operating system, ensuring that it is compatible with the existing 480 volt, 3-phase power supply. The Contractor will be responsible to ensure the new equipment, is compatible, programmed to and successfully communicates with existing REGIONAL DISTRICT SCADA system. The Regional District will provide limited SCADA assistance to the Contractor as required.
5. Installation of a well level data logger with a sounding tube.

UTILITY WORKS:

1. Complete all site civil improvements including the removal of the below ground well-head followed by the raising to above grade and connecting to the existing distribution water system.
2. Upsizing the existing and undersized 100mm discharge piping that leaves the well head to new 200mm Class 52 ductile iron piping complete with all new valving and service lines.
3. The replacement of the two (2) existing distribution gate valves with new 200 mm valves.
4. Supply and installation of above grade drinking water 4 inch x 8 inch diameter pitless adaptor wellhead and sanitary seal assembly.

1.3 All work will be completed in accordance with these Contract Documents and Drawings.

1.3.1 The Scope of Work includes, but is not limited to, the following elements:

1. All work required for the completion of a fully operational and functioning well, pitless adapter, and the electronic interface flow metering valve, complete.

2. The Work shall not be deemed complete until the Work is accepted by the Regional District. The Work, unless specifically stated otherwise, shall include the furnishing by the Contractor all labour, equipment, materials, supervision required for the completion of the work all in accordance with local, Provincial, and Federal laws and provisions. The Regional District has procured the Ministry of Transportation and Vancouver Coastal Heath permits. All other permits and licenses are the responsibility of the Contractor to obtain.

    a) Any minor or incidental item of the Work not called for in the Specifications or shown on the Drawings but clearly required to meet the intent of design and normally provided for the proper operation of the Work shall be provided as if specifically called for in the Contract Documents. The intent is that the Contractor provides a complete Project.

3. The Work of the Contract consists of the construction of all Work described and as shown in the Contract Documents and by implication.

4. The Work may commence at the Site immediately following the issuance of a Notice to Proceed and in compliance with the project milestones dates provided in the RFP requirements Section 1.3. The Work is to be substantially complete by the date indicated in Section 013200 – Construction Progress Documentation.

1.4 Contract Method

1.4.1 The Contractor shall construct the Work under a unit price Contract.

1.5 Responsibility

1.5.1 The Contractor shall be responsible for the safe keeping of the Regional District's materials and shall immediately replace or repair lost or damaged Regional District's Materials, including any associated equipment, appurtenances and accessories to the complete satisfaction of the Regional District and Regional District at no cost to the Regional District.

1.5.2 All Regional District Materials damaged by the Contractor shall be immediately repaired or replaced by the Contractor to the satisfaction of the Regional District, at no cost to the Regional District.

1.5.3 The Contractor shall be responsible for all mechanical and electrical interface connections for Regional District Materials and appurtenant connections.

1.5.4 The Contractor shall be responsible for final assembly and alignment, and shall provide the necessary labour, supervision, materials, to ensure that the equipment meets the alignment tolerance specified for the pump and motor equipment.

1.5.5 The Contractor is responsible for providing all labour, equipment and supplemental specialist support necessary to ensure the proper installation, trial operation, performance testing and proof of successful operation to achieve the designated requirements.

1.5.6 The Contractor is responsible for providing a Professional Geoscientist to oversee the installation of the replacement pump and motor, and completion of the well performance testing.

1.6 Permits

1.6.1 It is the Contractor's responsibility to obtain all required electrical, Technical Safety BC, Work Safe BC, and all other permits. The Regional District will procure the archeological, Vancouver Coastal Health and MoTI right of way encroachment permits.

1.6.2 The Contractor shall provide additional written notice to Ministry of Transportation and Infrastructure's (MoTI) Area Manager a minimum of seven (7) days prior to restrictions for residential access and lane closure through a MoTI H1080 form. The content and form of the written notifications shall be reviewed and approved by the Regional District prior to delivery. The Contractor will be responsible for preparation and submission of a traffic control plan to the Ministry and be responsible for providing the required traffic control as required by the Ministry

2.0 PRODUCTS

2.1 Product specifications is as specified within these Contract Documents.

3.0 EXECUTION

3.1 Execution of work is as specified within these Contract Documents.

END OF SECTION

SECTION 011400 WORK RESTRICTIONS

1.0 GENERAL

1.1 SPECIAL PROJECT NOTE:

1.1.1 The Contractor shall complete the project within the timelines specified in Section 013200 paragraph 1.3. The Contractor should also note the complete ban on all outdoor water use, including construction water, during the Sunshine Coast Regional District's imposed Stage four (4) water restrictions which can be imposed any time after July 15. See Sunshine Coast Regional District Bylaw 422 for a summary of the Sunshine Coast Regional District Drought Policy and outdoor water restriction program, https://web.scrd.ca/wp-content/uploads/2023/04/422-Water-Rates-and-Regulations-consolidated-to-include-422.42-in-effect-from-2023-JAN-12-to-present.pdf

2.0 PRODUCTS

Not Applicable.

3.0 EXECUTION

Not Applicable.

END OF SECTION

SECTION 012900 PAYMENT PROCEDURES

1.0 GENERAL

1.1 Measurement and Payment

1.1.1 The Work, including any Materials, equipment and services, will be paid for in accordance with the prices set out in Schedule of Prices, Specifications and in the RFP Document. Prices and any further breakdown do not limit the Work to the items listed therein. The Contractor has allowed for sufficient amounts to cover the cost of any Work or Materials not specifically listed in Schedule of Quantities but included in the Drawings and Specifications by either direct mention or implication, by including all such amounts in the items to which they pertain most closely in Schedule of Prices. Costs of a general nature that do not pertain to any one (1) item have been distributed among all the items.

1.2 Applications for Payment

1.2.1 Refer to contract payment provisions.

1.2.2 The Contractor shall use standard forms for submission of progress claims in the format agreed prior to the first application for payment.

1.2.3 Show previous amount claimed and the amount claimed for the period ending.

1.2.4 Show percentage of Work completed to date and holdback retained.

1.3 Changes in the Work

1.3.1 Refer to PART 6 CHANGES IN THE WORK (CCCD2 2020)

2.0 PRODUCTS

Not Applicable

3.0 EXECUTION

Not Applicable

END OF SECTION

SECTION 013200 CONSTRUCTION PROGRESS DOCUMENTATION

1.0 GENERAL

1.1 Description

1. Prior to the Regional District's approval for the Contractor to commence Work at the Site, the Contractor shall produce and submit a detailed Baseline Schedule, acceptable to the Regional District, which demonstrates the conformance to the requirements agreed to above and elsewhere in this Section. Once finalized and agreed to by the Regional District, this schedule will be deemed the Contract Schedule, to which the Contractor shall base all future updates and from which further detail will be developed.
2. Specifically, the Contract Schedule shall include, but not be limited to, a level of detail conforming to the following:
    a) Identify the work of both the Contractor and other Contractors that access the Site.
    b) Include submission, review and approval of critical Shop Drawings, product data, samples, etc. The Contractor shall manage the cycle(s) of all other Submittals using a compatible spreadsheet or database program. Refer to Section 013300 – Submittals.
    c) Include performance testing, verification, start-up and demonstration procedures by the Contractor, allowing appropriate intervals for commissioning by third parties, and for integrated system certification.
3. The Contractor shall base the scheduled duration of each activity on the Work being performed during the work week established and agreed upon as of the date of the Notice of Award with allowances made for legal holidays and normal weather conditions.
4. The Contractor shall advise the Regional District within two (2) days of any problems anticipated by any activity shown in the Contract Schedule.
5. The Contractor shall revise the schedule to reflect changes in the actual sequence and the future sequence of Work, should the actual sequence of Work performed by the Contractor deviate from the planned sequence indicated in the accepted Contract Schedule.

1.2 Submissions

1. The Contractor shall provide Submittals in accordance with Section 013300 – Submittals Procedures and with the requirements noted herein.

2. The Regional District's acceptance of any schedule submission does not relieve the Contractor from any of its contractual responsibilities.
3. For the initial submission of project controls documents, the Contractor shall submit one (1) electronic copy of the following:
    a) Critical Path Schedule in bar chart and time scaled logic diagram formats.
4. The Contractor shall submit monthly schedule status reports with the monthly progress claim consisting of two (2) hard copies and one (1) electronic copy of the following project control documents:
    a) Update of Critical Path Schedule in bar chart and time scaled logic diagram formats.
5. The Contractor shall show the percentage of completion of each item or activity as projected for the last day of the month for which the schedule is issued. Modify the timing and duration of future activities to indicate current planning.
6. The Contractor shall submit proposed revisions to the accepted Contract Schedule to the Regional District for review. Changes in timing for activities may be modified with agreement of the Contractor and Regional District. A change affecting the Contract Price, the completion time and sequencing of the Work may be made only by approved Change Order.

1.3 Project Milestone Dates

1. The Contractor should schedule the Work in accordance with the following Project Milestone Dates:
2. Substantial Completion and Commissioned:
    a) Two (2) months from Notice to Proceed Issuance.
3. Total Performance
    a) Three (3) weeks from Substantial Completion Issuance.

2.0 PRODUCTS

Not Applicable.

3.0 EXECUTION

Not Applicable.

END OF SECTION

SECTION 015000 TEMPORARY FACILITIES AND CONTROLS

1.0 GENERAL

1.1 Temporary Facilities

1. Installation/Removal
    a) The Contractor shall:
        i. Provide temporary toilet facilities for the Site.
2. Maintenance of Public Utilities
    a) The Contractor shall:
        i. Arrange Work to avoid interruption of utilities serving the Regional District and the public. Pay all penalties and costs including legal fees and other expenses imposed on the Regional District as a result of actions of the Contractor, its employees, or subcontractors.

1.2 Site Requirements – General

1. Sanitary Facilities
    a) The Contractor shall:
        i. Provide temporary portable toilet facilities for the use of the Contractor's, subcontractors' and the Regional District’s workforces.
        ii. Disinfect facilities frequently.
        iii. Dispose of sanitary wastes, in accordance with the applicable regulations.
        iv. Contain all wastewater and later dispose of it offsite at an approved facility at the Contractor's cost.
        v. Keep the Site and premises in a sanitary condition.
        vi. Post notices and take such precautions as required by local health authorities or other public agencies having jurisdiction.
2. Construction Power
    a) Coordinate the supply of an electrical power supply for construction purposes with BC Hydro.
    b) The Contractor shall:
        i. Locate construction power at the designated location.

ii. Provide and distribute construction power and lighting as required for the execution of the Work.

iii. Pay for its power connection, routing, consumption and similar costs.

iv. Provide its own source of construction power to operate other equipment when or where necessary.

v. Supply and pay for its own independent power for the Work.

vi. Install and maintain temporary facilities for power such as pole lines and underground cables to approval of local inspection authority.

2.0 PRODUCTS

Not Applicable

3.0 EXECUTION

Not Applicable

END OF SECTION

SECTION 017500 STARTING AND ADJUSTING

1.0 GENERAL

1.1 Project Commissioning

1. The Contractor shall:
    a) Promptly correct deficiencies and defects identified by the Regional District.
    b) Review maintenance manual contents (operation, maintenance instructions, Record Drawings, spare parts, materials) for completeness.
    c) Submit required documentation such as statutory declarations, Workers' Compensation certificates, warranties, certificates of approval or acceptance from regulating bodies.
    d) Attend the “end-of-work” testing and break-in or start-up demonstrations.
    e) Review inspection and testing reports to verify that the findings conform to the intent of the documents and that changes, repairs or replacements have been completed.
    f) Review condition of equipment that has been used in the course of the Work to ensure turning over at completion of the work is in “as new condition” with warranties, dated and certified from time of Substantial Performance of the Work.
    g) Arrange and coordinate instruction of Regional District's staff in care, maintenance and operation of building systems and finishes by suppliers or Subcontractors.
    h) When partial occupancy of uncompleted Project is required by the Regional District, coordinate Regional District's uses, requirements and access with Contractor's requirements to complete Project.
    i) Provide ongoing review, inspection and attendance to project call back, and maintenance, and repair problems during the warranty periods.
    j) Provide training during the Equipment Performance Testing period for the following equipment and systems:
        i. Pump and motor start up testing including performance pump curve and Flow control valve operation and testing.

2. All components of the above and below-mentioned systems as described within these contract documents and any identified equipment and systems in all Divisions.

1.2 Training Completion Forms and Payment

1. One (1) copy of Form 101 and will be required to demonstrate the pump and motor assembly operates correctly and without deficiencies.

2.0 PRODUCTS

Not Applicable

3.0 EXECUTION

3.1 The Contractor shall demonstrate to the Regional District satisfactory start up testing and operation of the submersible pump and motor by completion of the following Form 101.

FORM 101

CERTIFICATE OF SATISFACTORY EQUIPMENT PERFORMANCE

I certify that the equipment listed below has been continuously operated for at least two (2) full automatic operating cycles and that the equipment operates satisfactorily and meets its specified operating criteria. No defects in the equipment were found. The equipment is therefore classed as “conforming”.

PROJECT:

ITEM OF EQUIPMENT:

SERIAL NO:

REFERENCE

SPECIFICATION:

(Authorized Contractor Signature) Date

(Authorized Signing Representative of the Regional District) Date

END OF SECTION

SECTION 017800 CLOSEOUT SUBMITTALS

1.0 GENERAL

1.1 SECTION INCLUDES

1. Record Drawings, samples, and specifications.
2. Equipment and systems.
3. Product data, materials and finishes, and related information.
4. Operation and maintenance data.
5. Spare parts, special tools and maintenance materials.
6. Warranties and bonds.
7. Final site survey.

1.2 SUBMISSION

1. Prepare instructions and data using personnel experienced in maintenance and operation of described products.
2. A copy will be returned after the final inspection, with Engineer's comments.
3. Revise content of documents as required prior to final submittal.
4. Two (2) weeks prior to Substantial Performance of the Work, submit to the Engineer, two (2) final hardcopies of operating and maintenance manuals and one (1) digital version in PDF-A format in English.
5. Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of the same quality and manufacture as products provided in Work.
6. If requested, furnish evidence as to type, source and quality of products provided.
7. Defective products will be rejected, regardless of previous inspections. Replace products at their own expense.
8. Pay all costs of transportation.

1.3 FORMAT

1. Organize data in the form of an instructional manual.
2. Binders: vinyl, hard covered, 3 inch 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
3. When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

4. Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
5. Arrange content by systems under Section numbers and sequence of Table of Contents.
6. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
7. Text: Manufacturer's printed data, or typewritten data.
8. Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.4 CONTENTS - EACH VOLUME

1. Table of Contents: provide title of project:
    a) Date of submission; names.
    b) Addresses, and telephone numbers of Engineer and Contractor with name of responsible parties.
    c) Schedule of products and systems, indexed to content of volume.
2. For each product or system:
    a) List names, addresses and telephone numbers of subcontractors and suppliers, including local sources of supplies and replacement parts.
    b) Product Data: mark each sheet that clearly identifies specific products and component parts, and data applicable to installation; delete inapplicable information.
    c) Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.5 RECORD DRAWINGS AND SAMPLES

1. In addition to requirements in General Conditions, maintain at the site for Engineer one (1) record copy of:
    a) Contract Drawings.
    b) Specifications.
    c) Addenda.
    d) Change Orders and other modifications to the Contract.
    e) Reviewed Shop Drawings, product data, and samples.
    f) Field test records.

g) Inspection certificates.

h) Manufacturer's certificates.

2. Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
3. Label record documents and files in accordance with Section number listings in List of Contents of this Project Manual. Label each document "Project Record" in neat, large, printed letters.
4. Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
5. Keep Record Documents and samples available for inspection by the Engineer.

1.6 RECORDING ACTUAL SITE CONDITIONS

1. Record information on a set of black line opaque drawings and digitally for all Record Drawings and surveys.
2. Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
3. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
4. Contract Drawings and Shop Drawings: legibly mark each item to record actual construction, including:
    a) Measured depths of elements of foundation in relation to finish first floor datum.
    b) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
    c) Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
    d) Field changes of dimension and detail.
    e) Changes made by change orders.
    f) Details not on original Contract Drawings.
    g) References to related Shop Drawings and modifications.
5. Specifications: legibly mark each item to record actual construction, including:
    a) Manufacturer, trade name, and catalogue number of each product actually installed particularly optional items and substitute items.

b) Changes made by Addenda and change orders.

6. Other Documents: maintain Manufacturer's certifications, inspection certifications, field test records required by individual specifications sections.

1.7 FINAL SURVEY

1. Submit a final site survey certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 EQUIPMENT AND SYSTEMS

1. Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
2. Panel board circuit directories:
    a) provide electrical service characteristics,
    b) controls, and
    c) communications.
3. Include installed colour coded wiring diagrams.
4. Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
5. Maintenance Requirements:
    a) Include routine procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
    b) Provide servicing and lubrication schedule, and list of lubricants required.
    c) Include Manufacturer's printed operation and maintenance instructions.
    d) Include sequence of operation by controls manufacturer.
    e) Provide original Manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
    f) Provide installed control diagrams by controls manufacturer.

g) Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

h) Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

i) Provide a list of the original Manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

j) Provide an asset and life cycle list for all equipment.

k) Additional requirements: as specified in individual specification sections.

1.9 MATERIALS AND FINISHES

1. Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
2. Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
3. Moisture-protection and Weather-exposed Products: include Manufacturer’s recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
4. Additional Requirements: as specified in individual specifications sections.

1.10 MAINTENANCE MATERIALS

1. Provide maintenance and extra materials, in quantities specified in individual specification sections.
2. Provide items of the same manufacture and quality as items in Work.
3. Deliver to site specified items packaged to prevent damage, place and store.
4. Receive and catalogue all items. Identify, on carton or package, colour, room number, system or area, as applicable, where item is to be used. Submit inventory listing to Engineer. Include approved listings in Maintenance Manual.
5. Obtain receipt for delivered products and submit prior to final payment.

1.11 SPECIAL TOOLS

1. Provide special tools, in quantities specified in the individual specification section.

2. Provide items with tags identifying their associated function and equipment.
3. Deliver to site, place and store.
4. Receive and catalogue all items. Submit inventory listing to Engineer. Include approved listings in Maintenance Manual.

1.12 STORAGE, HANDLING AND PROTECTION

1. Store spare parts, maintenance materials, and special tools in a manner to prevent damage or deterioration.
2. Store in original and undamaged condition with Manufacturer's seal and labels intact.
3. Store components subject to damage from weather in weatherproof enclosures
4. Store paints and freezable materials in a heated and ventilated room.
5. Remove and replace damaged products at their own expense and to satisfaction of Engineer.

1.13 WARRANTIES AND BONDS

1. Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
2. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of principal responsible.
3. Obtain warranties and bonds, executed in duplicate by Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work.
4. The date of Substantial Performance will be the start date of the equipment warranty.
5. Verify that documents are in proper form, contain full information, and are notarized.
6. Co-execute submittals when required.
7. Retain warranties and bonds until time specified for submittal.

2.0 PRODUCTS

Not Used.

3.0 EXECUTION

Not Used.

END OF SECTION

DIVISION 02 EXISTING CONDITIONS

SECTION 024113 DEMOLITION

1.0 GENERAL

1.1 REFERENCES

1. Canadian Federal Legislation
    a) Canadian Environmental Protection Act (CEPA).
    b) Canadian Environmental Assessment Act (CEAA).
    c) Transportation of Dangerous Goods Act (TDGA)
    d) Motor Vehicle Safety Act (MVSA).
2. United States Environmental Protect Agency
    a) CFR 86.098-10, Emission Standards for 1998 and Later Model Year Otto-Cycle Heavy Duty Engines and Vehicles.
    b) CFR 86.098-11, Emission Standards for 1998 and Later Model Year Diesel Heavy Duty Engines and Vehicles.

2.0 PRODUCTS

2.1 STORAGE AND PROTECTION

1. Protect existing items designated to remain and items designated for salvage. In the event of damage to such items, immediately replace or make repairs with the approval of the Regional District and at no cost to Regional District.
2. In all circumstances ensure that demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
3. Do not dispose of waste of volatile materials such as mineral spirits, oil, petroleum-based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout the project.
4. Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
5. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
6. Protect trees, plants and foliage on site and adjacent properties where indicated.

3.0 EXECUTION

3.1 PREPARATION

1. Inspect the Site with the Regional District and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
2. All items indicated to be removed or salvaged shall be disposed of by the Contractor unless requested by the Regional District.
3. Locate and protect utilities. Preserve active utilities traversing site in operating condition.
4. Notify and obtain approval of utility companies before starting demolition.

3.2 SEQUENCES OF OPERATION

1. Removal
    a) Remove items as indicated.
    b) Do not disturb items designated to remain in place.
    c) When removing pipes under existing or future pavement areas, excavate at least 300 mm below pipe invert.
    d) Stockpile topsoil for final grading and landscaping. Provide erosion control and seeding if not immediately used. Cover all stockpiles with thick black coloured plastic sheeting and weight sheeting with sand filled sandbags or equivalent.
2. Removal from Site
    a) Interim removal of stockpiled material will be required by the Regional District, if it is deemed to interfere with the operations of Engineer or other contractors.
    b) Remove stockpiles of like materials by an alternate disposal option once collection of that material is complete.
    c) Only dispose of specified material by selected alternative disposal option as provided by Engineer. Do not dispose of these materials in a landfill or a waste stream destined for landfill. Additional disposal options will be provided by the Engineer’s on-site representative prior to disposal.
3. Salvage
    a) Carefully dismantle items containing materials for salvage and stockpile salvaged materials at locations as directed by the Regional District.

4. Sealing
    a) Seal pipe ends and walls of manholes or catch basins as indicated. Secure plugs to form watertight seal.
5. Disposal of Material
    a) Dispose of materials not designated for salvage or reuse on site at authorized facilities.

3.3 RESTORATION

1. Restore areas and existing works outside areas of demolition to match the condition of adjacent, undisturbed areas.
2. Use only soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.4 CLEANUP

1. Upon completion of work, remove debris, trim surfaces and leave the work site clean.
2. Use only cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.5 REPORTING

1. Record off-site removal of debris and materials and provide the following information regarding removed materials to Engineer within 24 hours.
    a) Time and date of removal.
    b) Type of material.
    c) Weight and quantity of materials.
    d) Final destination of materials.
2. The Contractor is responsible for ensuring all reporting requirements are fulfilled to the satisfaction of Engineer.

3.6 COORDINATION

1. Coordinate disposal activities with Engineer's on-site representative.
2. Potential volumes of divertible materials, a list of verified alternate disposal options, and a collection outline upon award of contract will be provided by the Engineer on request.
3. The Contractor is responsible for ensuring all coordination requirements are fulfilled to the satisfaction of the Engineer.

END OF SECTION

DIVISION 03 CONCRETE

SECTION 033000 CAST-IN-PLACE- CONCRETE

1.0 GENERAL

1.1 Description

1. The extent of concrete work is shown on the Contract Drawings. This section covers cast-in -place concrete including formwork, shoring for concrete and installation into formwork of items such as anchor bolts, and other items to be embedded in concrete.

1.2 Quality Assurance

1. Codes and Standards - Comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified.
2. American Society for Testing and Materials (ASTM)
    a) C33 “Standard Specification for Concrete Aggregate.”
    b) C94 “Standard Specification for Ready-Mixed Concrete.”
    c) C150 “Standard Specification for Portland Cement.”
3. Forming
    a) The Contractor shall be solely responsible for the adequacy of the forming, shoring and bracing design.
    b) Any formwork installed by the Contractor shall be solely at Contractor’s risk. The Engineer’s review will not lessen or diminish the Contractor’s liability.

1.3 Concrete Mix Designs

1. All concrete materials shall be proportioned so as to produce a workable mixture in which the water content will not exceed the maximum specified.

1.4 Ready-mixed Concrete

1. Ready-mixed concrete shall conform to the requirements of ACI 301 and ASTM C94. In case of conflict, ACI 301 shall govern.

2.0 PRODUCTS

2.1 Concrete Composition

1. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water, and specified additives so proportioned and mixed as to produce a plastic workable mixture in accordance with requirements of this section of the specification and suitable to the specific conditions of placement.

2.2 Portland Cement

1. Portland cement shall be from an approved source and shall conform to the requirements of the current ASTM Specification C150, for Type II cement. Only one (1) brand of cement from one (1) manufacturing plant may be used. The use of ground granulated blast furnace slag is not allowed.

2.3 Water

1. Water for mixing shall be clean, fresh and free from injurious amounts of oil, acid, chlorides, sulfates, alkali or organic matter. Water shall conform to ACI 301.

2.4 Proportioning Normal Concrete

1. Unless indicated otherwise on the Contract Drawings, concrete shall be of the following classes, each meeting the mix and compressive strength requirements as specified hereafter, and shall be used as follows:

    a) Class “C” Foundations and slabs, columns, column footings, and beams and appurtenances.

2.5 Measurement

1. All measurements shall be by weight. However, Contractor, at his own expense, may increase the cement content at a corresponding reduction in weight of aggregate and sand, whenever he is concerned that the minimum strength and mix ratio requirements under these specifications cannot be met. The amount of water to be used shall be the amount necessary to produce a plastic mixture of the specified slump.
2. The slump shall be between 2 inches and 4 inches when tested in accordance with ASTM Specifications C143. Variations in the slump range may be allowed by the Engineer if admixtures, such as water reducers or superplasticizers, are utilized in the concrete mix. Regardless of the measured slump, the maximum allowable water-cement ratios as specified herein shall be strictly adhered to.

2.6 Compressive Strength, Water and Cement Content

1. Notwithstanding what has been stated here before, and unless shown otherwise on the Contract Drawings, the concrete shall meet the following requirements:

		Class C
1. Min. Compressive Strength		4,000 psi
2. Max. Water Content (gallon per 94 lb. sack of cement)		4.5 gal.
3. Min. Cement Content (94 lb. sack of cement per cubic yard of solid concrete)		6.0 sacks
4. The cement content is required irrespective of strength. Up to a maximum of 15% of cementitious material may be fly ash in accordance with ASTM C618. The use ground granulated blast furnace slag is not allowed.		
5. The total chloride ion content of hardened concrete shall be less than 0.06% by weight of cement.		

2.7 Curing Compound

1. All horizontal, screeded and floated surfaces, exposed to drying winds and sunlight, shall be sprayed with ATLAS QUANTUM-CURE as manufactured by Atlas Construction Supply, Inc. (application rate: 200 sf/gallon) or equivalent. Application of the curing compound shall conform to the requirements specified within this Section
2. Alternate curing compounds will be accepted if they are pigmented or colored, such as white, at the time of application and are non-toxic to potable water. Regardless of the type of curing compound used, Contractor shall assume complete responsibility for its adequacy.

3.0 EXECUTION

3.1 Concrete Quality

1. Concrete shall conform to the requirements specified within this Section. The required proportions shall be assembled, well mixed, transported, placed, consolidated, finished and cured as here-in-after specified. Concrete shall be uniformly dense and sound, free from faults, cracks, voids, honeycomb and other imperfections.
2. If not called for specifically, and unless specified otherwise, concrete requirements shall follow ACI 301 where applicable.

3.2 Mixing

1. Concrete shall be batched in fully automatic or semi-automatic stationary plants or approved portable batch type plants and mixed in stationary or truck mixers. Mixing equipment and mixing procedures shall be subject to the approval of the Engineer.
2. Ready-mixed Concrete
    a) Provide central-mixed concrete conforming to ASTM C94 except as modified by these Specifications.
    b) Limit the haul time of central-mixed concrete so that the specified slump is attained without the onsite addition of water which will cause the mix design water-cement ratio to be exceeded. In no event shall the time exceed 90 minutes from the batch plant to the completion of the pour, unless specifically approved by the Engineer.
    c) Use truck-transported, dry-batched concrete or mix on the jobsite when haul time is excessive. Do not re-temper partially hardened concrete.
3. Cold joints in slabs and in wall-footings shall be avoided at all costs.
4. If avoidable, do not place concrete during rainstorms. Protect concrete placed immediately before rain to prevent rainwater from coming in contact with it. The Contractor will keep sufficient protective covering on hand at all times for this purpose.

3.3 Surface Finishes

1. Steel Trowel Finish
    a) This shall be an integral finish obtained by trowelling with a steel trowel after the surface has been floated and allowed to stand until all water-sheen has disappeared.
    b) Final trowelling shall be done after the concrete has hardened sufficiently to prevent drawing moisture and fine materials to the surface and when the concrete is sufficiently hard that no mortar accumulates on the trowel.
    c) Cement or mixture of cement and sand shall not be spread on surfaces to absorb excess water or to stiffen the concrete.
    d) Trowelling shall produce a dense, smooth, impervious surface free from defects and blemishes.

e) All finished top surfaces of wall and wall-corbel (if required), column-footings (if required) and slabs shall receive a smooth, even, level and hard (so called "burnt") steel trowel finish. The entire wall footing surface, particularly along each side of the circumferential waterstop in the area to receive neoprene pads, shall also receive a hard steel trowel finish.

2. Schedule of Finishes

a) Surface Description:

i. Slab on Grade: Smooth Steel Troweled Finish

3.4 Curing

1. The Contractor shall begin curing immediately after initial concrete set has occurred. Exposed concrete surfaces shall be kept moist during finishing operations prior to initiating specified curing procedures.
2. Curing of the slabs shall be made by covering the slab with curing blankets, which incorporate a water containing felt or burlap element and a white plastic cover and kept continuously wet for a period of no less than three (3) days. After removal of curing blankets the slab shall be sprayed with a curing compound.
3. All other horizontal, screeded and floated surfaces, exposed to drying winds and sunlight, shall be sprayed with a curing compound at an application rate of 200 sf per gallon or more as recommended by the manufacturer.
4. Water for curing shall be generally clean and free from any elements which might cause staining or discoloration of the concrete.
5. Cracked or damaged visible concrete surfaces shall be repaired appropriately for a completely smooth finished surface to the satisfaction of the Regional District.

END OF SECTION

DIVISION 09 PAINTING AND COATING

SECTION 099100 PAINTING

1.0 GENERAL

1.1 SUMMARY

1. This Sections requirements pertain to the painting of any exposed ferrous pipe and appurtenances. This section includes:
    a) Field applied paints and coatings for normal exposures.
    b) Painting Accessories.
2. Related sections:
    a) The Contract Documents are complementary; what is called for by one (1) is as binding as if called for by all.
    b) It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of the Contractor's Work.
    c) The following Sections are related to the Work described in this Section. This list of Related Sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the Contractor to see that the completed Work complies accurately with the Contract Documents.
        i. Section 013300 - Submittal Procedures.

1.2 SUBMITTALS

1. General: Submit as specified in Section 013300.
2. Shop Drawings: Include a schedule of where and for what use coating materials are proposed in accordance with requirements for Product Data.
3. Product data: Include description of physical properties of coatings including solids content and ingredient analysis, VOC content, temperature resistance, typical exposures and limitations, and Manufacturer's standard color chips.
4. Samples: Include 8 inch square drawdowns or brush-outs of topcoat finish when requested. Identify each sample as to finish, formula, color name and number and sheen name and gloss units.
5. Paint Schedule: Provide a schedule of all proposed paint products for the items to be painted in format matching the Schedule provided in Part 3 of this Section.

6. Paint Draw Down Samples: Submit two (2) painted samples, illustrating selected colors for each color and selected system. Submit on heavy paper card stock, 8 inch x 10 inch in size.

1.3 QUALITY ASSURANCE

1. Products: First line or best grade.
2. Materials for each paint system: By single manufacturer.
3. Applicator qualifications: Applicator of products similar to specified products with a minimum of five (5) years' experience.
4. Regulatory requirements:
    a) Comply with by using paints that do not exceed governing agency's VOC limits or do not contain lead.
    b) Conform to applicable code for flame and smoke rating requirements for products and finishes.
5. Field samples:
    a) Paint one (1) complete surface of each color scheme to show colors, finish texture, materials, and workmanship.
    b) Obtain approval before painting other surfaces.

1.4 PROTECTION

1. Protect adjacent surfaces from paint and damage. Repair damage resulting from inadequate or unsuitable protection.
2. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.
3. Place cotton waste, cloths, and material that may constitute fire hazard in closed metal containers and remove daily from site.
4. Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations.
5. Carefully store, clean and replace on completion of painting in each area.
6. Do not use solvent or degreasers to clean hardware that may remove permanent lacquer finish.

1.5 EXTRA MATERIALS

1. Extra materials: Deliver a minimum one (1) gallon of each type and color of coating applied:

a) When manufacturer packages material in gallon cans, deliver unopened labeled cans as comes from factory.

b) When manufacturer does not package material in gallon cans, deliver material in new gallon containers, properly sealed and identified with typed labels indicating brand, type, and color.

2.0 PRODUCTS

2.1 MANUFACTURERS

1. Paints.
2. Paint shall be Tnemec, or approved equal: Tnemec Co., Kansas City, MO.

2.2 PRETREATMENT, PRIMERS, AND PRIMER-SEALERS

1. Ferrous metal primer:
    a) Tnemec: Series 104.
2. Galvanized metal surface pretreatment materials:
    a) Carboline: Surface Cleaner 3.
3. Galvanized metal surface primer:
    a) Tnemec: Series 104.
4. Wood primer for opaque finish paint, interior exposure: one (1) of following or equal:
    a) Carboline: Sanitile 120.
    b) S/W: PrepRite Latex Primer B28W111.
5. Wood primer for opaque finish paint, exterior exposure: one (1) of following or equal:
    a) Carboline: Sanitile 120.
    b) S/W: A-100 Primer B42W.

2.3 METAL SURFACES

1. High solids epoxy (self-priming) not less than 72% solids by volume:
    a) Tnemec: HS Epoxy Series 104.
    b) Well Head Metal Kiosk to be painted “Forest Green.”

3.0 EXECUTION

3.1 INSPECTION

1. Thoroughly examine surfaces scheduled to be painted before starting work.

2. Start painting when unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

1. Prepare surfaces in accordance with paint Manufacturer's instructions or when none, the following:
    a) Canvas and cotton insulation coverings: Remove dirt, grease, and oil.
    b) Galvanized surfaces:
        i. Remove surface contamination and oils and wash with degreasers.
        ii. Apply coat of etching type primer.
    c) Zinc coated surfaces: Remove surface contamination and oils and prepare for priming in accordance with metal Manufacturer's recommendations.
    d) Unprimed steel and iron: Remove grease, rust, scale, dirt and dust by wire brushing, sandblasting or other necessary methods.
    e) Shop primed steel:
        i. Sand and scrape to remove loose primer and rust.
        ii. Feather out edges to make touch-up patches inconspicuous.
        iii. Clean surfaces.
        iv. Prime bare steel surfaces.
    f) Wood:
        i. Sandpaper to smooth even surface.
        ii. Wipe off dust and grit prior to priming.
        iii. Spot coat knots, pitch streaks, and sappy sections with sealer.
        iv. Fill nail holes and cracks after the primer has dried and sand between coats.

3.3 APPLICATION

1. Apply each coat at proper consistency.
2. Tint each coat of paint slightly darker than the preceding coat.
3. Sand lightly between coats to achieve the required finish.
4. Do not apply finishes on surfaces that are not sufficiently dry.

5. Allow each coat of finish to dry before the following coat is applied, unless directed otherwise by manufacturer.
6. Where clear finishes are required ensure tint fillers match wood.
    a) Work fillers well into grain before set.
    b) Wipe excess from surface.
7. Backprime exterior woodwork, which is to receive paint finish, with exterior primer paint.
8. Backprime interior woodwork, which is to receive paint or enamel finish, with enamel undercoat paint.
9. Prime top and bottom edges of metal doors with enamel undercoat when they are to be painted.

3.4 MECHANICAL AND ELECTRICAL EQUIPMENT

1. Identify equipment, ducting, piping, and conduit in accordance with Related Sections.
2. Remove grilles, covers, and access panels for mechanical and electrical system from location and paint separately.
3. Finish paint primed equipment with color selected by the Engineer.
4. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are plated or covered with prefinished coating.
5. Replace identification markings on mechanical or electrical equipment when painted over or spattered.
6. Paint dampers exposed immediately behind louvers, grilles, convector, and baseboard cabinets to match face panels.
7. Paint exposed conduit and electrical equipment occurring in finished areas with color and texture to match adjacent surfaces.
8. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
9. Color code equipment, piping, conduit, exposed ductwork, and apply color banding and identification, such as flow arrows, naming and numbering, in accordance with the Contract Documents.

3.5 SURFACES NOT REQUIRING FINISHING

1. Stainless steel, brass, bronze, copper, monel, chromium, anodized aluminum: Specially finished articles such as porcelain enamel, plastic coated fabrics, and baked enamel.
2. Items completely finished at factory, such as preformed metal roof and wall panels, aluminum frames, toilet compartments, sound control panels, acoustical tiles, shower compartments, folding partition, and flagpole.

3.6 CLEANING

1. As work proceeds and upon completion, promptly remove paint where spilled, splashed, or spattered.
2. During the progress of work, keep premises free from unnecessary accumulation of tools, equipment, surplus materials, and debris.
3. Upon completion of work, leave the premises neat and clean.

3.7 INTERIOR PAINT SCHEDULE

1. Metal, galvanized: two (2) coats of the following finish paints over specified primer:
    a) High Solids Epoxy:
        i. Surfaces not scheduled otherwise.
2. Metal, non-galvanized ferrous: two (2) coats of the following finish paints over specified primer:
    a) High Solids Epoxy: TNEMEC or equivalent.

END OF SECTION

Division 22 Plumbing

Section 220500 Common Results for Plumbing

1.0 GENERAL

1.1 REFERENCE STANDARDS

1. 2018 BC Plumbing Code, BCPC.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

1. Submit in accordance with Section 013300 - Submittal Procedures.
2. Product Data:
    a) Submit Manufacturer’s instructions, printed product literature and data sheets for material and include product characteristics, performance criteria, physical size, finish and limitations.
3. Shop Drawings:
    a) Indicate on drawings:
        i. Mounting arrangements.
        ii. Operating and maintenance clearances.
    b) Shop Drawings and product data accompanied by:
        i. Detailed drawings of bases, supports, and anchor bolts.
        ii. Acoustical sound power data, where applicable.
        iii. Points of operation on performance curves.
        iv. Manufacturer to certify current model production.
        v. Certification of compliance to applicable codes.
    c) In addition to transmittal letter referred to in Section 013300 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.3 CLOSEOUT SUBMITTALS

1. Submit in accordance with Section 017800 - Closeout Submittals.
2. Operation and Maintenance Data: submit operation and maintenance data for plumbing fixtures and equipment for incorporation into manual.
3. Operation and maintenance manual approved by, and final copies deposited with, Regional District before final inspection.

4. Operation data to include:
    a) Control schematics for systems including, where applicable, environmental controls.
    b) Description of systems and their controls.
    c) Description of operation of systems at various loads together with reset schedules and seasonal variances.
    d) Operation instruction for systems and components.
    e) Description of actions to be taken in the event of equipment failure.
    f) Valves schedule and flow diagram.
    g) Color coding chart.
5. Maintenance data to include:
    a) Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    b) Data to include schedules of tasks, frequency, tools required and task time.
6. Performance data to include:
    a) Equipment Manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    b) Equipment performance verification test results.
    c) Special performance data as specified.
7. Approvals:
    a) Submit (2) copies of draft Operation and Maintenance Manual to Regional District for approval. Submission of individual data will not be accepted unless directed by the Regional District.
    b) Make changes as required and re-submit as directed by the Regional District.
8. Additional data:
    a) Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

9. Site Records:
    a) The Regional District will provide one (1) set of reproducible Mechanical Drawings. Provide sets of whiteprints as required for each phase of work. Mark changes as work progresses and as changes occur.
    b) Transfer information to reproducibles, revising reproducibles to show work as actually installed. Maintain at least one (1) copy at the Site trailer for review by the Regional District.
    c) Use different color waterproof ink for each service.
    d) Make available for reference purposes and inspection.
10. Record Drawings:
    a) Prior to start of Testing, Adjusting and Balancing for plumbing, finalize production of As-Built Drawings.
    b) Identify each drawing in the lower right-hand corner in letters at least 12 mm high as follows: - "Record DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
    c) Submit to the Regional District for approval and make corrections as directed.
    d) Perform testing, adjusting and balancing for plumbing using As-Built Drawings.
    e) Submit completed reproducible As-Built Drawings with Operating and Maintenance Manuals.
11. Submit copies of As-Built Drawings for inclusion in final TAB report.

1.4 MAINTENANCE MATERIAL SUBMITTALS

1. Submit in accordance with Section 017800 - Closeout Submittals.
2. Furnish spare parts as follows:
    a) One (1) set of packing for each pump.
    b) One (1) casing joint gasket for each size pump.
    c) One (1) glass for each gauge glass.
3. Provide one (1) set of special tools required to service equipment as recommended by manufacturers.

1.5 Basic Product Requirements

1. DELIVERY, STORAGE AND HANDLING.
    a) Deliver, store and handle materials in accordance with the Manufacturer's written instructions.
    b) Delivery and Acceptance Requirements: deliver materials to Site in original factory packaging, labelled with Manufacturer's name and address.
    c) Storage and Handling Requirements:
        i. Store materials indoors in accordance with Manufacturer's recommendations in clean, dry, well-ventilated area.
        ii. Store and protect fixtures from nicks, scratches, and blemishes.
        iii. Replace defective or damaged materials with new.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

3.1 EXAMINATION

1. Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for fixture installation in accordance with Manufacturer's written instructions.
    a) Visually inspect substrate in presence of the Regional District.
    b) Inform the Regional District of unacceptable conditions immediately upon discovery.
    c) Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Regional District.

3.2 SYSTEM CLEANING

1. Clean interior and exterior of existing the building and all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 CLEANING

1. Progress Cleaning:
    a) Leave Work area clean at end of each day.
    b) Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

c) Waste Management: separate waste materials for recycling in accordance with Recycle BC guidelines.

i. Remove recycling containers and bins from Site and dispose of materials at appropriate facility.

3.4 PROTECTION

1. Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Section 221429 Sump Pump

1.0 GENERAL

1.1 DESCRIPTION

1. The section provided the specifications and requirement for the Manhole vault sump pump. The pump shall be manufactured by Zoeller Pump Company, M 53 or approved equal.

1.2 RELATED WORK

1. Section 010000, GENERAL REQUIREMENTS.
2. Section 013300, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
3. Section 330810, GENERAL COMMISSIONING REQUIREMENTS.

1.3 SUBMITTALS

1. Submittals, including number of required copies, shall be submitted in accordance with Section 013300, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
2. Manufacturer's Literature and Data including: the full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
    a) Pump:
        i. Manufacturer and model. Pump shall be manufactured by Zoeller, M 53 or approved equal
        ii. Operating speed (rpm).
        iii. Capacity.
        iv. Characteristic performance curves.
    b) Electric Motor:
        i. Manufacturer, frame and type.
        ii. Speed.
        iii. Current Characteristics and W (HP).
        iv. Efficiency.
    c) Control panel
    d) Sensors
3. Certified copies of all the factory and construction Site test data sheets and reports.

2.0 PRODUCTS

2.1 SUMP PUMP

1. The fully automatic sump pump is designed to remove unwanted groundwater in basement sump applications. The pump horsepower is to be of a professional-grade, 3/10 HP. The pump is to have a fully automatic float-operated sump pump. The white polypropylene float is solid so it cannot become waterlogged. This ensures that it is always buoyant and able to turn the pump on when necessary.
2. The pump's switch case, motor housing, and pump housing are to be constructed of cast iron. The corrosion resistant engineered plastic vortex impeller will have a smooth surface allowing water and solids to pass freely through the pump. The pump's identification tag, float guard, handle, switch arm, and hardware are to be made of non-corrodible stainless steel.
3. The pump is to conform to the following specifications:
    a) Dimensions: Height 10 ¼ inch x Width 7 3/4 inch x Length 10 ¼ inch.
    b) Horsepower: 3/10 HP.
    c) Voltage:115 V.
    d) Amps: 9.7.
    e) Hertz: 60 Hz.
    f) RPM: 1550.
    g) Discharge: 1 1/2 inch NPT.
    h) Solids Handling: ½ inch (12 mm) spherical solids.
    i) On/Off Points: 7 ¼ inch (18.4 cm) / 3 inch (7.6 cm) measured from the bottom elevation of the PVC sump pump basin.
    j) Impeller Material: Engineered plastic.
    k) Impeller Type: Vortex.
    l) Cord Length: 9 feet (2.7 m).
    m) PVC Sump Pump Basin size: Min 450 mm min diameter x 200 mm depth.

3.0 EXECUTION

3.1 STARTUP AND TESTING

1. Pump installation to comply with ANSI/HI 1.4 for sump pumps.
2. Contractor to provide 115 VAC from Pump Control room to power the sump pump and install a Ground Fault Circuit Interrupter (CFGI) inside the manhole.
3. Leak Test: Charge piping system and test for leaks. Test until there are no leaks. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
4. The tests shall include system capacity and all control and alarm functions.
5. When any defects are detected, correct defects and repeat test.
6. The Regional District will observe startup and Contractor testing of selected equipment. Coordinate the startup and Contractor testing schedules with Regional District.
7. The Contractor shall provide a minimum of five (5) working days prior to startup and testing.
8. Make certain that the receptacle is within the reach of the pump’s power supply cord. DO NOT USE AN EXTENSION CORD.
9. Make sure the pump electrical supply circuit is equipped with fuses or circuit breakers of proper capacity. A separate branch circuit is recommended, sized according to the “National Electrical Code” for the current shown on the pump nameplate.
10. Testing for ground. As a safety measure, each electrical outlet should be checked for ground using an Underwriters Laboratory Listed circuit analyzer which will indicate if the power, neutral and ground wires are correctly connected to your outlet. If they are not, call a qualified, licensed electrician.
11. For Added Safety. Pumping and other equipment with a three (3) prong grounded lug will be connected to a three (3) prong grounded receptacle.
12. For added safety the receptacle may be protected with a ground-fault circuit interrupter.

13. The pump will be connected in a watertight junction box. The plug can be removed and spliced to the supply cable with proper grounding. For added safety this circuit may be protected by a ground-fault circuit interrupter. The complete installation will comply with the National Electrical Code and all applicable local codes and ordinances.
14. The tank is to be vented in accordance with local plumbing code. Pumps will be installed in accordance with the National Electrical Code and all applicable local codes and ordinances.
15. Installation and servicing of electrical circuits and hardware should be performed by a qualified licensed electrician.
16. Pump installation and servicing will be performed by a qualified person.
17. The Contractor to verify the power source is capable of handling the voltage requirements of the motor, as indicated on the pump name plate.
18. The pump case and impeller will be covered with liquid before connecting the discharge pipe to the check valve and no inlet carries air to the pump intake.

3.2 DEMONSTRATION AND TRAINING

1. Provide services of Manufacturer’s technical representative for one (1) hour to instruct the Regional District Personnel in operation and maintenance of units.

END OF SECTION

Division 26 Electrical

Section 260553 Identification for Electrical Systems

1.0 GENERAL

1.1 SUMMARY

1. Section includes:
    a) Identification of electrical equipment, devices and components.
    b) Material, manufacturing and installation requirements for identification devices.

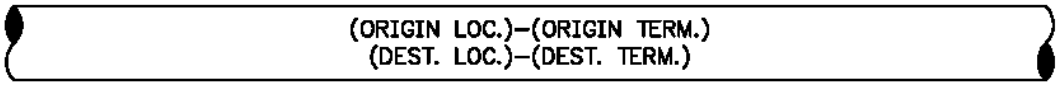
1.2 SYSTEM DESCRIPTION

1. Nameplates:
    a) Provide a nameplate for each piece of electrical equipment and devices, control panel and control panel components.
    b) Provide all nameplates of identical style, color, and material throughout the facility.
    c) Device nameplates information:
        i. Designations as indicated on the Drawings and identified on the Process and Instrumentation Drawings.
2. Wire numbers:
    a) Coordinate the wire numbering system with all vendors of equipment so that every field wire has a unique number associated with it for the entire system:
        i. Wire numbers shall correspond to the wire numbers on the Control Drawings or the panel and circuit numbers for receptacles and lighting.
        ii. Wire numbers shall correspond to the terminal block number to which they are attached in the control panel.
        iii. Internal panel wires on a common terminal shall have the same wire number.
        iv. Multi-conductor cables shall be assigned a cable number that shall be attached to the cable at intermediate pull boxes and stub-up locations beneath freestanding equipment. All multi-conductor and instrumentation cables shall be identified at pull points as described above:

v. Label all armored multi-conductor cable using the conduit number as indicated on the Contractor supplied electrical Drawings.

b) Provide the following wiring numbering schemes throughout the project for field wires between process control module, (RTU), vendor control panels, (VCP).

OR



Where:

ORIGIN LOC.= Designation for originating panel or device ORIGIN TERM.= Terminal designation at originating panel or device DEST. LOC.= Designation for destination panel or device

DEST. TERM.= Terminal designation at destination panel or device or PLCI/O address at destination panel

1.3 SUBMITTALS

1. Furnish submittals as specified in Sections 013300.
2. Product data:
    a) Nameplates:
        i. Color.
        ii. Size:
            a. Outside dimensions.
            b. Lettering.
        iii. Material.
        iv. Mounting means.
    b) Nameplate schedule:
        i. Show exact wording for each nameplate.
        ii. Include nameplate and letter sizes.

c) Wire numbers:

i. Manufacturer’s catalog data for wire labels and label printer.

3. Record documents:

a) Update the conduit schedule to reflect the exact quantity of wire numbers including spares and destination points for all wires.

2.0 PRODUCTS

2.1 MANUFACTURERS

1. Nameplates and signs:

a) One (1) of the following or equal:

i. Brady.

ii. Seton.

2. Conductor and cable markers:

a) Heat-shrinkable tubing:

i. One (1) of the following or equal:

a. Raychem.

b. Brady.

c. Thomas & Betts.

d. Kroy.

3. Conduit and raceway markers:

a) One (1) of the following or equal:

i. Almetek: Mini Tags.

ii. Lapp Group: Maxi System.

2.2 MATERIALS

1. Nameplates:

a) Fabricated from white-center and red face or black-center, white face laminated plastic engraving stock:

i. 3/32-inch-thick material.

ii. Two-ply.

iii. With chamfered edges.

iv. Block style engraved characters of adequate size to be read easily from a distance of 6 feet:

a. No characters smaller than 1/8 inch in height.

2. Signs:
    a) Automatic equipment and high voltage signs:
        i. Suitable for exterior use.
        ii. In accordance with OSHA regulations.
3. Conductor and cable markers:
    a) Machine printed black characters on white tubing.
    b) 10-point type or larger.
4. Conduit and raceway markers:
    a) Non-metallic:
        i. UV resistant holder and letters.
        ii. Black letters on a yellow background.
        iii. Minimum letter height: ½ inch.
        iv. Adhesive labels are not acceptable.
        v. Sump Pump Power Receptacle to be watertight.

2.3 SOURCE QUALITY CONTROL

1. Nameplates:
    a) Provide all nameplates for control panel operator devices (e.g. pushbuttons, selector switches, pilot lights, etc.).
    b) Same material and same color and appearance as the device nameplates, in order to achieve an aesthetically consistent and coordinated system.

3.0 EXECUTION

3.1 INSTALLATION

1. Nameplates:
    a) Attach nameplates to equipment with rivets, bolts or sheet metal screws, approved waterproof epoxy-based cement or install metal holders welded to the equipment.
    b) On NEMA Type 4X enclosures, use epoxy-based cement to attach nameplates.
    c) Nameplates shall be aligned and level or plumb to within 1/64 inch over the entire length:

i. Misaligned or crooked nameplates shall be remounted or provide new enclosures at the discretion of the Engineer.

2. Conductor and cable markers:
    a) Apply all conductor and cable markers before termination.
    b) Heat-shrinkable tubing:
        i. Tubing shall be shrunk using a heat gun that produces low temperature heated air.
        ii. Tubing shall be tight on the wire after it has been heated.
        iii. Characters shall face the open panel and shall read from left to right or top to bottom.
        iv. Marker shall start within 1/32 inch of the end of the stripped insulation point.
3. Conduit markers:
    a) Furnish and install conduit markers for every conduit in the electrical system that is identified in the conduit schedule or part of the process system:
    b) Conduit markings shall match the conduit schedule developed by the Contractor.
        i. Contractor to mark all conduits.
        ii. Each end of conduits that are greater than 10 feet in length.
        iii. Where the conduit penetrates a wall or structure.
        iv. Where the conduit emerges from the ground, slab, etc.
        v. The middle of conduits that are 10 feet or less in length.
    c) Mark conduits after the conduits have been fully painted.
    d) Position conduit markers so that they are easily read from the floor.
    e) Attach non-metallic conduit markers with nylon cable ties:
        i. Provide ultraviolet resistant cable ties for conduit markers exposed to direct sunlight.
    f) Mark conduits before construction review by Engineer for punch list purposes.
4. Signs and labeling:
    a) Furnish and install permanent warning signs at mechanical equipment that may be started automatically or from remote locations:

i. Fasten warning signs with round head stainless steel screws or bolts. Locate and mount in a manner to be clearly legible to operations personnel.

b) Furnish and install warning signs on equipment that has more than one (1) source of power.

i. Place warning signs to identify every panel and circuit number of the disconnecting means of all external power sources.

c) Place warning signs on equipment that has 120 VAC control voltage source used for interlocking.

i. Identify panel and circuit number or conductor tag for control voltage source disconnecting means.

d) Contractor to install and route from electrical control room, 115-volt alternating current to the inside of the manhole to power the submersible sump pump.

END OF SECTION

SECTION 262923 VARIABLE FREQUENCY MOTOR CONTROLLERS

1.0 GENERAL

1.1 DESCRIPTION OF WORK

1. This section covers the Contractor's design, furnishing and installation of variable frequency drive (VFD) units required for the project hereafter referred to as VFDs and the dv/dt output filter, known as collectively the VFD equipment.
2. The VFD equipment and dv/dt output filter shall be designed by the Contractor's electrical engineer and the Contractor shall provide all the components and features as necessary for operation from the Shore power and also for future operation from standby power served from a future on-site generator. The on-site generator is not included in this contract, but provisions for the VFD to run off of standby power shall be provided for as part of this contract.
3. The equipment to be wall mounted inside the existing electrical room.

1.2 STANDARDS AND CODES

1. The equipment shall be in compliance with IEEE 519 Guide for Harmonic Control and Reactive Compensation for Static Power Converters, 1992 issue.
2. All materials and equipment specified herein shall be approved by the Underwriter's Laboratories or other Province approved testing agencies, for the purpose for which they are used and shall bear the testing agencies' label.
3. All materials and equipment specified herein shall conform to all applicable NEMA, ANSI and IEEE standards.
4. All materials and equipment specified herein, and their installation methods shall conform to the latest published version of the National Electric Code (N.E.C.).
5. The VFD will be housed within a stainless steel NEMA Type 4X enclosure with a fan mounted for air circulation.

1.3 SUBMITTALS

1. Submit catalog data showing pertinent overall dimensions and component information. Also provide interconnecting wiring diagrams complete with terminals numbers.

1.4 COORDINATION

1. The Contractor shall be responsible for the procuring an electrical engineer for the design and operation of the VFD. The Contractor shall be responsible for obtaining the electrical supplier of the VFD equipment. The electrical supplier shall equip the assemblies with all

appurtenances and accessories (including but not limited to output signal contacts, input signal interface and terminal strips) as required for interface with the Pump Station Control Panel to provide totally integrated and operable system. The control panel will be factory tested in the presence of the Engineer, at the Contractor's Integrator factory. The full simulation of passing run tests will be completed to the satisfaction of the Regional District at the Contractor's Integrators factory. Upon successful factory start up, the Regional District will then authorize shipment of the panels to the job Site.

1.5 WARRANTY

1. The VFD equipment and all material and devices contained therein, shall be warranted to be free from defects in materials and workmanship for a period of one (1) year from project acceptance.

1.6 FACTORY TESTING

1. All VFD equipment including factory-supplied options shall be completely tested at the Integrator's place of business for successful operation before shipment. Documentation shall be furnished upon request of the engineer and the Regional District Personnel must witness the successul final factory testing at the Integrator's place of business before the VFD is shipped to the job site.

1.7 OPERATIONS AND MAINTENANCE DATA

1. The Manufacturer of the VFD equipment shall prepare and assemble detailed operation and maintenance manuals. The manuals shall contain data that shall include but not be limited to the following:
2. Programming instructions.
    a) Preventative maintenance procedures.
    b) Trouble-shooting.
    c) Calibration.
    d) Testing.
    e) Replacement of components.
3. Automatic mode operation.
    a) Manual mode operation.
    b) System schematics.
    c) Record Drawing wiring diagrams.
    d) Catalog data and complete parts list for all equipment and control devices.
    e) Listing of recommended maintenance tools and equipment.

2.0 PRODUCTS

2.1 GENERAL DESCRIPTION

1. Drive equipment furnished under this specification shall be industrial grade. The VFD shall be an ABB Model ACS550.
2. The VFDs shall use sine coded pulse width modulated (PWM) switching techniques to control the motor under all speed and load conditions. The VFDs shall be six (6) pulse type units. The controller shall not degrade the line displacement power factor to be less than .95 at any load or speed.
3. The VFD shall be capable of converting 480V (+10% to -10%) 60- hertz, 3-phase power to a fixed potential DC bus level. The equipment shall include full wave rectifiers, DC line reactor.
4. The VFD must be equipped with a DvV/Dt outline line filter/

2.2 OPERATIONAL FEATURE REQUIREMENTS

1. The primary speed control by 4-20mA signal from the Pump Station Control Panel.
2. The analog motor speed feedback signal by a 4-20mA signal from the Pump Station Control Panel.

2.3 ADDITIONAL FEATURES AND REQUIREMENTS

1. Main lugs power feeder connection.
2. Percent line side filtering. The VFD supplier shall be responsible for furnishing NEMA 4X enclosures for mounting filters above the VFD enclosure if the filters cannot be installed in the VFD equipment enclosure.
3. Normally open digital output contacts for “pump run”, and “VFD Fault” status conditions.
4. Signal and control interface circuitry as provided by the Contractor’s electrical engineer.
5. Enclosure mounted operator interface keypad to be utilized to configure all operating parameters and display diagnostic faults and VFD status.
6. The VFD shall have the selectable feature of providing automatic restart after utility power failure.

3.0 EXECUTION

3.1 GENERAL

1. The VFD equipment and dv/dt output line Filter shall be completely factory pre-wired, tested and delivered to the Site ready for external connections to field equipment. Before and during the installation, the VFD equipment shall be protected from Site contaminants.

2. The VFD equipment shall not be installed until the building environment can be maintained within the service conditions required by the Manufacturer.

3.2 INSTALLATION

1. Only workers who are skilled and experienced in the installation of VFD equipment shall perform the installation of the VFD equipment in the electrical room.
2. Installation shall include all interconnecting wiring between the VFD equipment and the Pump Station Control Panel and equipment motors. All field installed control and signal wiring installed by the Contractor shall be labeled at both ends for ease of servicing in accordance with the requirements of Section 260553.

3.3 INSPECTION AND VERIFICATION OF INSTALLATION

1. After completion of the installation of the VFD and Sine Wave Filter, the Contractor' shall inspect the installation and verify that all components and wiring are correctly installed. The Manufacturer shall determine the exact scope and nature of work required to correct deficiencies and errors in the work and shall supervise the performance of such work.

3.4 START-UP

1. After completion of the installation, the Manufacturer shall place the VFD equipment and Sine Wave Filter into operation.
2. The Contractor shall be solely and completely responsible for all maintenance of the system from time of start-up to the date of acceptance, by formal action of the Regional District, of all work under the contract. The Contractor, with the assistance of the Manufacturer as necessary, shall correct all deficiencies and defects and make any and all repairs, replacements, modifications and adjustments as malfunctions or failures occur. The Contractor shall perform all such work required to cause and maintain proper operation of the VFD equipment.
3. The Contractor and the Manufacturer of the VFD equipment shall anticipate that the Regional District may delay acceptance of all work under the contract if, in the judgment of the Regional District, malfunctions or failures in operation of the VFD equipment occur after start-up. Both the Contractor and the Manufacturer shall not be entitled to an extension of time or to any claim for damages because of hindrances, delays or complications caused by or resulting from delay by the Regional District in accepting the work because of malfunctions or failures in operation of the VFD equipment.

3.5 OPERATION AND MAINTENANCE TRAINING

1. The Manufacturer of the VFD equipment shall conduct specifically organized training sessions in operation and maintenance of the VFD equipment for personnel employed by the Regional District. The training sessions shall be conducted to educate and train the personnel in maintenance and operation of the units. Training shall include, but not be limited to, the following:
    a) Preventative maintenance procedures.
    b) Programming procedures.
    c) Troubleshooting.
    d) Calibration.
    e) Testing.
    f) Replacement of components.
    g) Automatic mode operation.
    h) Manual mode operation.
2. One (1) training session of at least two (2) four (4) hours in duration, shall be conducted at the pump station (after successful start-up of all systems) concerning instruction and operation of the VFD equipment. The Manufacturer shall prepare and assemble specific instruction materials for each training session and shall supply such materials to the Regional District prior to the time of the training.

END OF SECTION

Division 30 Earthwork

SECTION 310000 Earthwork and Erosion Control and Clay Seal

1.0 GENERAL

1.1 SUMMARY

1. Section includes:
    a) Loosening, excavating, filling, grading, borrow, hauling, preparing subgrade, compacting in final location, wetting and drying, and operations pertaining to Site grading for the removal of the underground valve vaults, manhole, and other facilities
    b) Backfilling and compacting under and around the new well head and water line, and manhole structures.
    c) Installation of the Clay Bentonite Well head seal.
    d) Construction of erosion control siltation fences and rocked construction entrance.
    e) Sealing of the Well Head with a Bentonite Clay Seal.
2. Related sections:
    a) The Contract Documents are complementary; what is called for by one (1) is as binding as if called for by all.
    b) It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of the Contractor's Work.
    c) The following Sections are related to the Work described in this Section. This list of Related Sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the Contractor to see that the completed Work complies accurately with the Contract Documents.
        i. Section 31_05_15 - Soils and Aggregates for Earthwork.

1.2 REFERENCES

1. ASTM International (ASTM):
    a) D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
    b) D 1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft3 (2,700 kN m/m3)).

c) D 6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

1. Backfill adjacent to structure: Backfill within volume bounded by the exterior surfaces of structure, the surface of undisturbed soil in the excavation around structure, and finish grade around structure.
2. Excavation: Consists of loosening, removing, loading, transporting, depositing, and compacting in final location, wet and dry materials, necessary to be removed for purposes of construction of manhole structure, waterline ditches, grading, and such other purposes as are indicated on the Drawings.

1.4 SYSTEM DESCRIPTION

1. Performance requirements:
    a) Where mud or other soft or unstable material is encountered, remove such material, and refill space with stabilization material. Wrap stabilization material with stabilization fabric.
    b) Obtain acceptable import material from other sources if surplus obtained within the Site do not conform to specified requirements or are not sufficient in quantity.
    c) No extra compensation will be made for hauling of the fill material(s) nor for water required for compaction.

1.5 SUBMITTALS

1. Excavation plan.
    a) Testing lab: Submit Contractor's proposed testing laboratory capabilities and equipment.
    b) Test reports:
        i. Submit certified test reports of all tests specified to be performed by the Contractor.
2. Quality assurance
    a) Initial compaction demonstration:
        i. Adequacy of compaction equipment and procedures: Demonstrate adequacy of compaction equipment and procedures before exceeding any of following amounts of earthwork quantities:
            a. 50 cubic yards of backfill adjacent to structures.

b. 100 cubic yards of embankment work.

c. 100 cubic yards of fill.

d. 50 cubic yards of roadway base material.

e. 100 cubic yards of road fill.

ii. Compaction sequence requirements: Until the specified degree of compaction on previously specified amounts of earthwork is achieved, do not perform additional earthwork of the same kind.

iii. After satisfactory conclusion of the initial compaction demonstration and at any time during construction, provide confirmation tests as specified under "FIELD QUALITY CONTROL."

3. Sequencing and scheduling

a) Schedule earthwork operations to meet requirements specified in this Section for excavation and uses of excavated material.

b) If necessary, stockpile excavated material in order to use it at specified locations.

c) Excavation, backfilling, and filling: Perform excavation, backfilling, and filling during construction in manner and sequence that provides drainage at all times.

2.0 PRODUCTS

2.1 MATERIALS

1. Water for compacting: Use water from source acceptable to Engineer.
2. Soil and rock materials: Provide soil and rock sieve gradation to the Regional District for review and approval prior to incorporation into the work.
3. General:

a) Provide aggregate base course, native material, sand, and select material where specified or indicated on the Drawings.

b) If suitable surplus materials are available, obtain native material and select material from cut sections or excavations imported materials.

4. Aggregate-based course materials: As specified in the plans.

5. Bentonite sealant: Bentonite used to prepare slurries for sealing the well head shall be specifically designed for this purpose. All bentonite slurries shall be prepared and installed according to the Manufacturer's instructions. Active solids content (bentonite) shall be 20% by weight or greater in all bentonite slurries. The active solids shall be checked by using the following formula:
6. Weight of Bentonite (lbs) / (Weight of Bentonite (lbs) + Gallons of water X 8.33 lbs/gal) X 100=% Solids.
7. Unhydrated bentonite including pelletized, granulated, powder, or chip bentonite may be used in the construction of seals. The bentonite material shall be specifically designed for sealing and be within the industry tolerances for dry western sodium bentonite. Placement of bentonite shall conform to the Manufacturer's specifications and result in a seal free of voids or bridges. (c) All bentonite used in any well shall be certified by NSF/ANSI approval standards for use in potable water supply wells. The product shall be clearly labeled as meeting these standards.

3.0 EXECUTION

3.1 EXAMINATION

1. Verification of conditions:
    a) Character and quantity of material:
        i. Verify character and quantity of rock, gravel, sand, silt, water, and other inorganic or organic materials to be encountered in work to be performed.
        ii. Determine gradation and shrinkage, and swelling of soil, and suitability of material for use intended in work to be performed.
        iii. Determine quantity of material, and cost thereof, required for construction of backfills, cuts, embankments, excavations, fills, and roadway fills, whether from onsite excavations, or imported materials. Include in cost of work to be performed.
        iv. Include wasting of excess material, if required, in cost of work to be performed.

3.2 PREPARATION

1. Backfills:
    a) After clearing and excavation are completed, scarify entire areas which underlie backfills or structures to a depth of 6 inch and until surface is free of ruts, hummocks, and other features which would prevent uniform compaction by equipment to be used.
    b) Recompact scarified areas to density specified before placing backfill material or concrete.
2. Embankments:
    a) After clearing is completed, scarify entire areas which underlie embankments to a depth of 6 inch and until surface is free of ruts, hummocks, and other features which would prevent uniform compaction by equipment to be used.
    b) Recompact scarified areas to density specified for embankments before placing of embankment material.
3. Fills:
    a) After clearing is completed, scarify entire areas which underlie fill sections or structures to a depth of 6 inch and until surface is free of ruts, hummocks, and other features which would prevent uniform compaction by equipment to be used.
    b) Recompact scarified areas to density specified for compacted fills before placing of fill material or concrete.

3.3 INSTALLATION

1. General:
    a) Dispose of excavated materials which are not required or are unsuitable for fill and backfill in lawful manner.
    b) Dispose of surplus material on private property only when written permission agreement is furnished by Regional District of property. Submit copies of such agreements.
    c) Obtain material required in excess of suitable material produced by cuts and excavation, from borrow areas subject to the material requirements specified.
    d) Rocks, broken concrete, or other solid materials larger than 4 inches in greatest dimension: Remove from Site at no additional cost to Regional District.

e) Stabilization of subgrade: Provide materials used, or perform the Work required, to stabilize subgrade so it can withstand loads which may be placed upon it by Contractor's equipment.

f) Install a rocked construction entrance and well drilling rig pad in accordance with the plans.

g) Install siltation fences, a minimum of two (2) along Knight Road to prevent sediment laden run-off from entering and open ditches.

2. Borrow area: There is no borrow area on Site.

a) Where material is required, import material from source located off Site selected by the Contractor and subject to acceptance by the Engineer.

b) There will be no additional cost to the Contract for use of imported material.

3. Compaction:

a) Provide specified compaction for backfills, cuts, embankments, fills, roadway fills, and other earthwork.

b) Perform confirmation tests to verify and confirm that work has complied, and is complying at all times, with compaction requirements specified in this Section for initial compaction demonstration and field quality control testing.

c) In-place density of compacted backfills, cuts, embankments, fills, and roadway fills determined in accordance with ASTM D 1556, or with ASTM D 6938.

d) Maximum density obtained in laboratory when tested in accordance with ASTM D 1557.

e) To prevent damage to structures due to backfilling operations, place backfill with equipment that does not exceed H20 feet loading, within a distance from the face of the structure of not less than half (½) the depth of backfill. The depth of backfill is the distance between the level being compacted and the bottom of the excavation. Outside this distance, heavier compaction equipment may be used.

f) Compact to percentage of maximum density as follows:

i. Backfill adjacent to structures: 95%.

ii. Backfilling voids: 95%.

iii. Other areas: 85%.

iv. Under present and future structures: 95%.

v. Under roadways, parking and storage areas, curbs, and sidewalks: 95%.

vi. Upper 6 inch of cuts: 95%.

vii. Fills: 95%.

4. Excavation:

a) Excavations for structures:

i. Provide excavations conforming to dimensions and elevations indicated on the Drawings for each structure, including trenching for piping and all work incidental thereto. For the waterline installation, the Contractor is to excavate to the widths and depths as shown in the plans and in accordance with the details provided.

ii. After clearing is complete, excavate the structure down to the elevation indicated on the Drawings. Unless directed by Engineer, do not carry excavations below elevation indicated on the Drawings.

iii. Where soil is encountered having unsuitable bearing value, Engineer may direct in writing that excavation be carried to elevations below those indicated on the Drawings.

iv. Where excavations are made below elevations indicated on the Drawings, adjust elevations of excavations in accordance with the following requirements:

a. Under slabs: Restore to proper elevation in accordance with procedure specified for backfill in this Section.

b. Under footings: Restore to the proper elevation using one (1) of the following:

- Aggregate base-course.

b) Excavation width:

i. Extend excavations at least 0.75 m clear from walls and foundations of structures to allow for placing and removal of forms, installation of services, and inspection.

a. Do not undercut slopes.

b. Difficulty of excavation: No extra compensation will be made for removal of rock or any other material due to the difficulty of excavation.

c) Excavation of lined channels:

i. Excavations in open cut for lined channels may be made so as to place concrete directly against excavated surfaces providing faces of excavations are:

a. Firm and unyielding.

b. Will stand or can be made to stand without sloughing.

ii. Excavations to provide subgrade for lined channel or subdrainage material: Excavate to lines and grades indicated on the Drawings.

d) Excavation of Manholes:

i. Excavate to lines and grades indicated on the Drawings.

ii. Perform excavation and grading so that finish surfaces are in uniform planes with no abrupt breaks in surface.

e) Excavation of waterlines:

i. Cut waterline ditches accurately to cross sections and grades indicated on the Drawings.

ii. Take care not to excavate ditches and gutters below grades indicated on the Drawings.

iii. Backfill excessive ditch and gutter excavations to grade with suitable material acceptable to Engineer that is thoroughly compacted.

iv. Do not deposit any material within 3 feet of edge of ditch unless otherwise indicated on the Drawings.

f) Necessary over excavation:

i. Where it becomes necessary to excavate beyond normal lines of excavation in order to remove boulders or other interfering objects, backfill voids remaining after removal as specified in backfilling of voids below, or as acceptable to the Engineer.

ii. Backfill voids with material acceptable to the Engineer:

a. With acceptance of the Engineer, backfill with one (1) of the following:

- Aggregate base course.
- Controlled low strength material.

g) Materials for backfills, embankments, fills, roadway fills:

i. General:

a. Obtain imported material from other sources if surplus materials from cuts and excavations obtained from within Site do not conform to specified requirements or are not sufficient in quantity for construction of Project.

h) Backfills:

i. Backfill adjacent to structures, slabs, or walls: Native material, or imported material meeting the requirements of native material unless otherwise specified or indicated on the Drawing.

ii. Backfill material under concrete structures: Aggregate base course material, except in areas where controlled low strength material or concrete encasement are indicated on the Drawing.

iii. Extend backfill in any area under concrete structures from undisturbed soil or rock to the bottom aggregate base course material layer.

i) Embankments:

i. Select material, or imported material meeting the requirements of select material unless otherwise specified or indicated on the Drawings.

j) Fills:

i. Native material or imported material will meet the requirements of native material unless otherwise specified or indicated on the Drawing.

ii. Extend fill in any area under concrete structures from undisturbed soil or rock to the bottom aggregate base course material layer.

k) Placement:

i. General:

a. Lines and grades:

- Construct backfills, embankments, fills, and road fills, at locations and to lines and grades indicated on the Drawings.
- Overbuild all permanent fill slopes by at least one 1 foot and then cut to final grade to provide adequate compaction of the remaining fill.

3.4 FIELD QUALITY CONTROL

1. ADJUSTING
    a) Finish grades of excavation, backfill, and embankment.
    b) Repair and re-establish grades to required elevations and slopes due to any settlement or erosion that may occur from action of the elements or any other cause prior to final acceptance.
2. PROTECTION
    a) Finish grades of backfills, cuts, excavations, and fills.
    b) Protect newly graded areas from erosion and deterioration by action of the elements.
3. Waterline Ditches:
    a) Maintain waterline ditches free from detrimental quantities of debris that might inhibit drainage until final acceptance.

END OF SECTION

DIVISION 33 UTILITIES

SECTION 330513 VALVE VAULT

1.0 GENERAL

1.1 SECTION INCLUDES

1. Contractor to furnish and install a shallow precast reinforced waterproofed valve complete with a triple door hatch, complete.

1.2 REFERENCES

1. The following is a list of standards which may be referenced in this section: ASTM International (ASTM) A48/A48M, Standard Specification for Gray Iron Castings, C150, Standard Specification for Portland Cement, C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.

1.3 SUBMITTALS

1. Contractor shall submit Manufacturer's technical descriptions of manhole sections, steps, rings, and covers.
2. Contractor shall submit repair materials and methods to Engineer for review and approval.
3. Material and procedures to be used in structure abandonment shall be approved by Engineer.

2.0 PRODUCTS

2.1 MATERIALS.

1. Precast Reinforced Valve Vault:
    a) Precast reinforced valve vault shall a shallow profile vault as fabricated by Langley Concrete Group or approved equal.

b) Joints: All precast concrete joints shall be made with a preformed joint sealer or grout. All joints that are made with the joint sealer shall also be pointed with mortar on the inside of the section. Mortar used in jointing precast concrete manhole sections shall be composed of one (1) part Portland cement and not more than three (3) nor less than two (2) parts of fine aggregate. Portland cement shall meet the requirements of ASTM C150, Type II. Hydrated lime or masonry cement shall not be used. Fine aggregate shall consist of well-graded natural sand having clean, hard, durable, uncoated grains, free from organic matter, soft or flaky fragments or other deleterious substances such as calcium chloride. The fine aggregate shall be thoroughly washed and shall be uniformly graded from coarse to fine with a minimum of 95% passing the #4 sieve and a maximum of 7% passing the #100 sieve. All mortar shall be fresh for the WORK at hand. Mortar that has begun to set shall not be used. Joint Seals: All joint seals shall be flexible neoprene rubber free from kinks and any defects.

2. Valve Vault Steel Access Lid:

a) The valve vault steel access is to be a triple opening hatch configuration with a non-slam shut assisted closing damper assembly. The steel hatch will be AASHTO H20 traffic loaded and shall be slip resistant diamond plated.

3.0 EXECUTION

3.1 GENERAL

1. The valve vault shall be constructed on a properly compacted subgrade and in such a manner that the center of the manhole coincides with the intersection of the projected centerlines of the inlet and discharge pipelines. The surface shall be level to permit proper construction of the riser sections. Changes in size and grade of channels for gravity pipelines shall be made gradually and evenly using concrete made with ASTM C150, Type II Portland cement. The floor of the valve vault shall be sloped towards the invert of the discharge drain line that shall discharge all water to the finish grade on Knight Road.

3.2 INSTALLATION

1. Placement valve vault will be plumb. Lifting Holes: Fill all lifting holes with mortar and sanded smooth. The interior valve vault walls will be painted white, two (2) coats with a cement water-proof paint, TNEMEC or approved equal. All pipe and conduit penetrations thorough the manhole will be core drilled and the annual space between the pipe and the manhole wall filled with waterproof flexible sealant

The vault shall be watertight from infiltration and exfiltration of water. The Contractor shall inspect and repair all visible leaks and damp spots.

3.3 ABANDONMENT

1. Well vaults to be removed and disposed of by the Contractor, any and all pipes entering or exiting the structure that are to be abandoned are to be plugged with lean concrete or controlled low strength material backfill the existing valve vaults shall be removed to the grade and width specified and backfilled with the material as shown on the plans. Surface restoration shall be completed to match the surrounding areas. Well vault aluminum hatch shall be salvaged, stored, and delivered to the Regional District Mason Road Works yard by the Contractor.

END OF SECTION

SECTION 331100 GROUND WATER SOURCES

SECTION 331113 POTABLE WATER SUPPLY WELLS

1.0 GENERAL

1.1 TEMPORARY TEST PUMP REMOVAL AND PERMANENT PUMP INSTALLATION

1. The static groundwater level will be measured and recorded. The replacement pump and motor stainless Franklin pump and motor assembly supplied by the Contractor will be installed into the groundwater supply well with the pump intake installed at a depth to be field verified by the Contractor's Professional Geoscientist. For estimating purposes, assume the preliminary depth of pump and motor install depth will be at approximately 102 m (334 ft) below top of ground surface. The installation depth will be confirmed by Contractor's Geoscientist and in the presence of the Engineer of Record and the actual pump intake depth recorded.
2. Along with the permanent pump, two (2) schedule 40 PVC, 25mm nominal ID sounding tubes to be installed. The sounding tubes will extend from the top of casing to the top of the pump intake. The bottom meter of the sounding tubes will be slotted with maximum five (5) mm perforations and an end cap will be secured to the bottom end of the tubes. The sounding tubes will be installed at the same time as the pump and at a depth to coincide with the bottom of the pump intake.

1.2 WELL DISINFECTION PROCEDURAL SPECIFICATIONS

1. Following the permanent replacement pump and motor installation, diluted liquid 6% to 8% sodium hypochlorite (household bleach), as approved by the Geoscientist, will be poured into the well to shock chlorinate direct the discharge and kill any bacteria. The volume of chlorine will be determined by Contractor's Geoscientist. The QWD / QPI will direct discharge water back into the well casing, cleaning the sodium hypochlorite from the casing, drop-pipe, and wiring. Once chlorine is present in the discharge line, the chlorine will be considered wholly circulated. Pumping will stop for 24-hours to allow for sufficient contact time between the chlorine solution, the well screen, and surrounding aquifer.
2. The well water will be pumped to storage containers and treated with sodium thiosulphate to remove chlorine. Dechlorinated water shall meet the British Columbia Approved Water Quality Guidelines for maximum exposure, controlled, intermittent concentrations for Marine and Estuarine Aquatic Life for chlorine.
3. Once the water quality has been dechlorinated to maximum

concentrations of 0.40 mg/L[1] for chlorine, a pH between 7.0 and 8.7 [2], and the concentration results have been achieved. The dechlorinated well water can be discharged to ground at the drainage ditch located approximately 30 m south-southeast of the pumphouse. Solids from the tank(s) shall be disposed of in accordance with local legislation.

4. Disinfection procedures shall be in accordance with AWWA C654 standard for disinfection of wells and will be undertaken after the permanent pump, drop pipe and pump wire has been installed into the groundwater supply well.

1.3 ANALYSIS REQUIREMENTS

1. Samples for bacteriological analysis shall be collected at the pump discharge in sterile laboratory by the Regional District in sampling bottles and analyzed for coliform organisms.
2. After sterilization, the well shall be pumped at open discharge to an aboveground storage holding tank. The water shall be pumped until chlorine odour cannot be detected, and the chlorine concentration is <0.40 mg/L. The well will be pumped free of chlorine before the water samples are collected for laboratory analysis.
3. Water samples shall be collected from the well on two (2) successive days for laboratory analysis of coliform organisms. Laboratory results will indicate that the samples are free from coliform organisms with each sample before the well is accepted for potable water use.
4. The samples shall be collected by the Regional District in laboratory provided sampling bottles, provided by the Regional District. The coliform organism analysis and approval shall be made by the laboratory, and the Regional District shall furnished a copy of the laboratory report to the Contractor.
5. If any coliform organisms are found present in the samples, the QWD / QPI shall re-sterilize the well and have the water resampled, as stated above until such time as no coliform organisms are found present in a water sample analysis.
6. All expenses of sterilization of the pump and laboratory analyses for coliform organisms shall be borne by the QWD / QPI.

1.4 MATERIAL SPECIFICATIONS

1. 25 mm nominal schedule 40 PVC to be used for two depth sounding tubes. The end of the sounding tubes will coincide with the bottom of the pump intake.

2. Aboveground storage tank(s) for pump and treat to neutralize/dechlorinate well water prior to discharge.
3. Down-hole optical well camera will need an on-board lighting array, side view with 180° swivel, down-view, and the ability to record time-stamped footage. The camera will need to be able to descend to a depth of 108 m.
4. Well descaling/cleaning (proprietary acid blend) and disinfection (6% to 8% sodium hypochlorite) chemicals.
5. Neutralizing chemicals:
    1.4.5.1 Sodium thiosulphate for chlorine
    1.4.5.2 Soda ash for pH
6. Water-tight bin for collecting solids and debris from well.

1.5 FIELD QUALITY CONTROL

1. Witnessing: All field testing shall be supported in person by the Contractor's Geoscientist; provide advanced notice of field testing as specified in Section 460594.
2. Inspection and checkout: As specified in Sections 460594.
3. Equipment performance test: Test level as scheduled; test as specified in Section 460594.

1.6 Regional District's FIELD SERVICE

1. Require Regional District's Water Utility Operations Department and the Regional District's Engineer of Record to inspect permanent pumping system and set-up before initial start-up to certify that system has been correctly installed and prepared for start-up as specified in this Section and in other pertinent Sections.

2.0 Products

Not Used

3.0 Execution

Not Used

END OF SECTION

DIVISION 33 WATER UTILITIES

SECTION 331133 VERTICALLY SUSPENDED SUBMERSIBLE WELL PUMP, MOTOR AND PITLESS ADAPTER UNIT

1.0 GENERAL

1.1 The replacement vertical submersible pump and motor (pump assembly) and the Pitless Adapter with features are shown in the Contract Drawings. This section includes installation ot the replacement submersible pump and motor assembly and commissioning. The Contractor will furnish and install a new 150 mm dia submersible vertical pump and motor assembly, complete for a fully operational Variable Frequency Drive (VFD) system including a VFD DV/DT outlet filter. Work also includes the installation of an epoxy coasted pitless adapter well head assembly, “Baker Monitor” or approved equal to grade, Work also includes removal of the existing well head, and well vault, replacement of the undersized 100 mm discharge piping, and inline isolation valves followed by the replacement with new 200 mm ductile iron discharge piping all as shown in accordance with these plans and specifications,

1.2 It is the Contractor’s responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor’s Work

1.3 Qualifications.

1. Work under this section may only be completed by a registered well driller or pump installer registered in British Columbia and the Contractor supplied Professional Geoscientist registered in the British Columbia.

2.0 PRODUCTS

2.1 The pitless adapter is to be a “Baker Model Monitor PS Industrial Pitless Unit” or approved equal and will be 4 inch by 8 inch in size.

2.2 Coatings

1. The pump assembly shall be stainless steel. For bidding purposes, the Regional District has specified the installation of a Franklin Series stainless steel submersible turbine pump Model 300 SSI 50 F66 1464, 14 stage pump and motor assembly, with a 4 inch discharge pipe assembly. The Contractor shall procure the recommended pump and motor assembly identified by the Professional Geoscientist from the first phase of this project. The estimated Total Dynamic Head (TDH) is estimated at 560 ft and a flow rate of 240 GPM. The Contractor is to confirm these data set points prior to ordering the pump and motor.
2. Nameplate.
    i. The pumping unit shall have a stainless steel or aluminum nameplate located in an easily visible location on the pitless adapter (rivet in place) and a second spare loose nameplate (for mounting in the control cabinet). The nameplate shall include at least the following data:
        a. Pump model, manufacturer.
        b. Year of manufacture.
        c. Serial number.
        d. Number of stages.
        e. RPM (at rated capacity).
        f. Design condition (head and flow) .
        g. Shut off head.
        h. Bearing numbers.
        i. Weight (pump, column, shaft and discharge column).
    ii. The motor shall have a stainless steel or aluminum nameplate located in an easily visible location on the pitless adaptor and a second spare loose nameplate (for mounting in the control cabinet). The nameplate shall include at least the following data:
        a. Motor model, manufacturer.
        b. Serial number.
        c. Voltage, amperage.
        d. Frequency.
        e. Power factor.
        f. Insulation class.

g. Horsepower.
h. RPM.
i. Service factor.
j. Locked rotor current.
k. Weight.

3.0 EXECUTION

3.1 The Professional Geoscientist is to be provided by the Contractor. The Geoscientist is to determine the well redevelopment chemical concentrations and dosing as part of the well redevelopment work.

Pump installation and well testing and performance pump testing will be performed by the Pump Installer (QPI) or Qualified Well Drillers (QWD), and in the presence of the pump manufacturer. The Contractor will provide the Professional Geoscientist at key points throughout the installation and testing, as described below. In no case, will the QPI or QWD complete activities without pre-approval from the Contractor's Geoscientist, where the procedural specifications indicate involvement from the Contractor's Geoscientist.

3.2 The "Well Identification Plate" is a requirement of the B.C. Ground Water Regulation for all wells. The plate shall be secured to the top of the pitless unit. If the plate already exists on the existing well casing it shall be removed and transferred to the completed well head after the casing has been trimmed. The plate shall be 38 mm x 75 mm stainless steel and include the unique Well Identification Number issued by the Province. The plate shall be secured to the well within completion of the work. Confirmation of the plate installation including location on the well head and the Well Identification Number shall be included on the Record Drawings and in the O&M manuals submitted by the Contractor.

3.3 The pumping unit, drop pipe, and pitless unit shall be assembled by a qualified machinist or millwright. A copy of the pumps' operations and installation manual will be supplied to the Contractor. The pitless well unit shall be welded onto the well casing. The Contractor shall ensure that the orientation of the pitless unit is correct relative to the centreline of the discharge piping. The Contractor shall verify the bury and connection dimension of the pitless adaptor prior to fabrication.

3.4 The 4 inch dia steel drop pipe shall be assembled in approximately 3 m (10-foot) sections using extra strong half couplings. The Contractor shall ensure that each connection and joint is properly tightened using strap or chain wrenches with suitable extension handles. The interior pipe coating will not be damaged during installation of the pumping unit. Any damage to the exterior coating will be kept to a minimum. All threaded connections shall have “never seize” applied to the threads to ensure the coupling can be dismantled at a later date. Discharge tube check valves must be installed at every 150 ft intervals.

3.5 During the installation of the pump, motor and drop pipe, care will be taken to ensure the power and electrode cables, and water level tubing are not damaged or pinched against the sides of the well casing. The power cable shall be tested for continuity during installation as outlined in the installation instructions. Testing for continuity and checking the splice and insulation resistance shall be carried out in accordance with the Manufacturer’s instructions.

3.6 The plastic tubing for the water level sensor and depth sounding shall be secured to the drop pipe with nylon electrical tie wraps at 1 m intervals.

3.7 The power cables to the submersible motor shall be secured to the drop pipe with stainless steel punch lock banding complete with a 3-conductor cable guard at each banding location. Alternate methods of banding the power cable will require prior approval of the Regional District Representative. The power cable shall be supported independently from the plastic tubing. The later items shall be fastened to the drop pipe after the power cable is secured in place.

3.8 The pumping unit shall be pump flow tested in accordance with the applicable sections of the Hydraulic Institute Standards (current edition). Upon successful completion of the initial test, the Regional District Representative is to be contacted to witness the final test. In particular, the following items shall be tested and/or confirmed with the Engineer in presence:

1. Correct rotation of pumping unit.
2. Current draw and voltage at all operating conditions.
3. Flow and drawdown in the well when the pumping unit is operating. s
4. Response to all control functions both in the “hand” and “automatic mode.”

The submersible pump power supply cables shall be tested with a megger during the pump installation to check the insulation resistance The insulation resistance will conform to the Manufacturer’s requirements and under no circumstances shall the resistance be below two (2) million ohms or any of the three (3) legs deviate significantly. If the readings are imbalanced or below two (2) million ohms the pump shall be removed and the problem rectified.

3.9 Test well riser piping to 1,035 kPa (150 psi) for two (2) hours. Leakage shall not exceed allowable leakage for the pump check valves. Provide a written report to the Regional District summarizing the results of the pressure and leakage testing for each section. The report will include the type of test, duration, allowable leakage rate, and actual leakage. The Contractor shall coordinate the start-up with the Regional District.

3.10 Check Valves must be placed every 150 feet in the discharge drop pipe.

END OF SECTION

Division: 40 Process Equipment

Section: 406100 Common Work Results for Process Control and Instrumentation Systems

1.0 GENERAL

1.1 SUMMARY

1. Section includes:
    a) General requirements applicable to all Process Control and Instrumentation Work.
    b) General requirements for process control and instrumentation submittals.
    c) As specified in this Section, the RTU programming shall be provided by the Contractor. The Regional District SCADA programming will be provided by the Regional District.
2. Related sections:
    a) The Contract Documents are complementary; what is called for by one (1) is as binding as if called for by all.
    b) It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor's Work.
        i. Items involving electrical, control, and instrumentation construction may be indicated on the Drawings or specified in the Specifications that do not apply specifically to electrical, control and instrumentation systems.
3. Interfaces to equipment, instruments, and other components:
    a) The Contractor shall be responsible to provide all design, engineering, material and labor needed to install the actual equipment furnished, include all costs to add any additional instruments, wiring, control system inputs/outputs, controls, interlocks, electrical hardware etc., which may be necessary to make a complete, functional installation based on the actual equipment furnished:
        i. Make all changes necessary to meet the Manufacturer's wiring requirements.
4. The Contractor shall procure an electrical engineer to prepare, and engineer stamp a complete set of Drawings and Specifications in order to ensure that all items related to the instrumentation and control systems are completely accounted for.
5. The Contractor shall be responsible for all the instrumentation, and control equipment and systems for the entire project to comply with a fully

operational and functioning control system.

6. Contract Documents:
    a) General:
        i. The Drawings and Specifications are complementary and are to be used together in order to fully describe the Work.
    b) Specifications:
        i. These requirements are in addition to all General Requirements.
    c) Contract Drawings:
        i. The Contractor shall procure and provide both the licensed integrator and the programmer to complete the Instrumentation and Control Drawings. The instrumentation and Control Drawings shall show in a diagrammatic manner, the desired locations, and arrangements of the components of the Instrumentation Work. Follow the Drawings as closely as possible, use professional judgment and coordinate with the other trades to secure the best possible installation, use the entire Drawing set for construction purposes.
        ii. The Contractor has the freedom to select any of the named manufacturers as identified in the individual Specifications; however, the Engineer has designed the spatial equipment layout based upon a single manufacturer and has not confirmed that every named Manufacturer's equipment fits in the allotted space. It is the Contractor's responsibility to ensure that the equipment being furnished fits within the defined space.

1.2 SUBMITTALS

1. Furnish submittals as specified in Section 013300 and this Section.
2. General:
    a) Instruct all equipment suppliers of submittals and operation and maintenance manuals of the requirements in this Section.
    b) Furnish the submittals required by each section in the Electrical Specifications.
    c) Adhere to the wiring numbering scheme specified in Section 260553 throughout the Project:
    d) Uniquely number each wire.
        i. Wire numbers will appear on all Equipment Drawings.
    e) Use equipment and instrument tags, as indicated on the Drawings,

for all submittals.

3. Submittal preparation:

    a) In these Contract Documents, some items of Work are represented schematically, and are designated for the most part by numbers, as derived from criteria in ISA-5.1:

        i. Employ the nomenclature and numbers designated in this Section and indicated on the Drawings exclusively throughout Shop Drawings, data sheets, and similar submittals.

    b) Specific submittal requirements:

        i. Shop Drawings:

            a. Required for materials and equipment listed in this and other sections.

            b. Furnish sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications.

            c. Shop Drawings requirements:

                - Front, side, and, rear elevations, and top and bottom views, showing all dimensions.
                - Locations of conduit entrances and access plates.
                - Component layout and identification.
                - Schematic and wiring diagrams with wire numbers and terminal identification.
                - Connection diagrams, terminal diagrams, internal wiring diagrams, conductor size, etc.
                - Anchoring method and leveling criteria, including Manufacturer's recommendations for the Site seismic criteria.
                - Weight.
                - Finish.
                - Nameplates:
                    - As specified in Section 260553 or as indicated in the Drawings.
                - Temperature limitations, as applicable.

            d. Use equipment and instrument tags as depicted on the P&IDs for all submittals.

e. Adhere to wiring numbering scheme outlined in Section 260553 throughout the Project:

f. Wire numbers will appear on all Equipment Drawings.

g. Organize the shop drawing submittals for inclusion in the Operation and Maintenance Manuals:

- Furnish the initial shop drawing submittal bound in one (1) or more standard size, 3-ring, D-ring, loose leaf, vinyl plastic, hard cover binders suitable for bookshelf storage.
- Binder ring size: 2 inches or larger.

h. Include the letterhead and/or title block of the firm responsible for the preparation of all Shop Drawings. Include the following information in the title block, as a minimum:

- The Contractor's registered business name.
- The Contractor's physical address, email address, and phone number.
- Regional District's name.
- Project name and location.
- Drawing name.
- Revision level.
- Personnel responsible for the content of the drawing.
- Date.

i. The work includes modifications to existing circuits:

- Clearly show all modifications to existing circuits.
- In addition, show all existing unmodified wiring to clearly depict the functionality and electrical characteristics of the complete modified circuits.

ii. Product data:

a. Submitted for non-custom manufactured material listed in this and other sections and shown on Shop Drawings.

b. Include:

- Catalog cuts.

- Bulletins.
- Brochures.
- Quality photocopies of applicable pages from these documents.
- Identify on the data sheets the Project name, applicable specification section, and paragraph.
- Identify model number and options for the actual equipment being furnished.
- Neatly cross out options that do not apply or equipment not intended to be supplied.

c. Use equipment and instrument tags as depicted on the P&IDs for all submittals.

d. Adhere to wiring numbering scheme outlined in Section 260553. Organize the operation and maintenance manuals for each process in the following manner:

- Section A - Process and Instrumentation Diagrams.
- Section C - Loop Drawings.
- Section D - Instrument Summary.
- Section E - Instrument Data Sheets and Brochures.
- Section F - Sizing Calculations.
- Section G - Instrumentation Installation Details.
- Section H - Test Results.
- Section I - Operational Manual.

iii. Material and equipment schedules:

a. Furnish a complete schedule and/or matrix of all materials, equipment, apparatus, and luminaries that are proposed for use:

- Include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.

iv. Itemized instrument summary:

a. Submit a hard copy of the instrument summary.

b. List all of the key attributes of each instrument including:
    - Tag number.
    - Manufacturer.
    - Model number.
    - Service.
    - Area location.
    - Calibrated range.
    - Loop drawing number.

c. Associated LCP, VCP, PCM, or PLC.

v. Instrument data sheets and cut sheets:

a. Furnish fully completed data sheets, both electronically in Microsoft Word or Excel and in hardcopy, for each instrument and component according to ISA-20 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves. The data sheets provided with the instrument specifications are preliminary and are not complete. They are provided to assist with the completion of final instrument data sheets. Additional data sheets may be required. Include the following information on the data sheet:
    - Component functional description specified in this Section and indicated on the Drawings.
    - Manufacturers model number or other product designation.
    - Tag number specified in this Section and indicated on the Drawings.
    - System or loop of which the component is a part.
    - Location or assembly at which the component is to be installed.
    - Input and output characteristics.
    - Scale range with units and multiplier.
    - Requirements for electric supply.
    - Requirements for air supply.
    - Power consumption.

- Response timing.
- Materials of construction and of component parts that are in contact with, or otherwise exposed to, process media, and or corrosive ambient air.
- Special requirements or features, such as specifications for ambient operating conditions.
- Features and options that are furnished.

b. Provide a technical brochure or bulletin (“cut sheet”) for each instrument on the project. Submit with the corresponding data sheets:

- Where the same make and model of instrument is used in two (2) or more applications on the project, and the process applications are nearly identical, and the materials, features and options are identical submit one (1) brochure or bulletin for the set of identical instruments.
- Include a list of tag numbers for which it applies with each brochure or bulletin.
- Furnish technical product brochures that are complete enough to verify conformance with all Contract Document requirements, and to reflect only those features supplied with the device.
- Cross out models, features, options, or accessories that are not being provided.
- Clearly mark and identify special options and features.

c. Organization: Index the data sheets and brochures in the submittal by systems or loops.

vi. Installation recommendations:

a. Submit the Manufacturer’s printed recommendations for installation of instrumentation equipment.

vii. Training submittals:

a. Develop and submit for review a general training plan for approval by Regional District within 14 calendar days from Notice to Proceed. Include complete

descriptions of all planned training classes, a preliminary training schedule, a list of all proposed instructors along with resumes, examples of proposed training manuals, and a description of any special training tools to be used (simulators, self-paced modules, personal computer- based training, etc.).

b. The Engineer will review the general training plan. Special emphasis will be placed on review of the qualifications of the proposed instructors and the timing of the individual courses to maximize their effectiveness. If, in the opinion of the Engineer, the proposed instructors are not sufficiently qualified to conduct the specified training courses, or lack experience, where required, on the specific configuration of the system, provide more qualified instructors.

c. The general training plan and schedule shall be updated by the Contractor at the beginning of each Phase and approved by the Regional District a minimum of 30 days prior to commencement of training.

d. Training course plan submittals:

- Describe any student pre-requisites for the course or training activity.
- Provide an updated schedule for all sessions of the course, including dates, times, durations, and locations.
- Submit training materials.

e. Incorporate all submittal review comments into the course.

f. Do not conduct training courses before review and acceptance of the Course Plan submittal for the course.

viii. Project Record documents:

a. Record Drawing requirements:

- Provide Project Record Drawing of all Instrumentation Drawings.
- Update Record Drawings weekly.
- Record Drawings will be fully updated as a condition of the monthly progress payments.

- Clearly and neatly show any and all changes.

b. All existing pipe, conduit, wire, instruments or other structures encountered or uncovered during construction.

ix. Instrument Installation Drawings:

a. Submit, instrument installation, mounting, and anchoring details for all components and assemblies, including access requirements and conduit connection or entry details.

b. Furnish for each instrument a dedicated 8 ½ inch by 11 inch installation detail that pertains to the specific instrument by tag number.

c. For each detail, provide certification and the hard copies, by the instrument manufacturer, that the proposed installation is in accordance with the instrument Manufacturer's recommendations and is fully warrantable.

d. For each detail, provide, as a minimum, the following contents:

- Necessary sections and elevation views required to define instrument location by referencing tank, building or equipment names and numbers, and geographical qualities such as north, south, east, west, basement, first floor, etc.
- Ambient temperature and humidity where the instrument is to be installed.
- Corrosive qualities of the environment where the instrument is to be installed.
- Hazardous rating of the environment where the instrument is to be installed.
- Process line pipe or tank size, service and material.
- Process tap elevation and location
- Upstream and downstream straight pipe lengths between instrument installation and pipe fittings and valves.
- Routing of tubing and identification of supports.
- Mounting brackets, stands, anchoring devices,

and sunshades.

- Conduit entry size, number, location, and delineation between power and signal.
- NEMA ratings of enclosures and all components.
- Clearances required for instrument servicing.
- List itemizing all manufacturer makes, model numbers, quantities, lengths required, and materials of each item required to support the implementation of the detail.

x. Commissioning and Process Start-up Submittals:

a. Inform the Regional District and or Engineer of the day, date, and time for a scheduled test at least 15 calendar days before the test takes place to

b. allow the Regional District and or Engineer sufficient time to plan travel to the test site.

c. Provide certified and witnessed test and calibration checklists for each of the following tests.

- Functional Testing.
- Loop Validation Tests, loop Validation:
  - Complete field device loop tests have been successfully completed for all individual instruments, all separate analog control networks, all valves, all VCPs, all motors, all local operator interface panels, all motor control centers, etc.,
- Calibration, adjustment, and test details for all components and systems.
- Process Operational Period.

xi. Test reports:

a. As specified in Section 013300.

1.3 QUALITY ASSURANCE

1. Manufacture instruments at facilities certified to the quality standards of ISO 9001.
2. Furnish all equipment listed by and bearing the label of UL or of an independent testing laboratory acceptable to the Engineer and the

Authority Having Jurisdiction.

3. Industrial Control Systems (ICS) :

    a) The Contractor, through the use of the ICS, is responsible for the implementation of the Process Control Interface System (PCIS) and the integration of the PCIS with other required instrumentation and control devices.

    b) Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that the ICSC be responsible for the integration of the PCIS with devices provided under the Contract Documents with the objective of providing a completely integrated control system.

1.4 DELIVERY, STORAGE, AND HANDLING

1. Special instructions:

    a) Securely attach special instructions for proper field handling, storage, and installation to each piece of equipment before packaging and shipment.

2. Tagging:

    a) Tag each component and/or instrument to identify its location, instrument tag number, and function in the system.

    b) Firmly attach a permanent tag indelibly machine marked with the instrument tag number, as given in the tabulation, on each piece of equipment constituting the PCIS.

    c) Tag instruments immediately upon receipt in the field.

    d) Prominently display identification on the outside of the package.

    e) Utilize the Tag and Loop Number identifications shown on the P&IDs.

3. Delivery and inspection:

    a) Deliver products in undamaged condition, in Manufacturer’s original container or packaging with identifying labels intact and legible. Include date of manufacture on label.

1.5 PROJECT OR SITE CONDITIONS

1. Site conditions:

    a) Provide a PCIS, including all equipment, raceways and any other components required for a complete installation that meets the environmental conditions for the Site.

1.6 SEQUENCING

1. General:
    a) Testing requirements are specified herein and in other sections.
2. Installation Testing:
    a) Commence after acceptance of all training, wire test, calibration tests, and loop validation tests, and all inspections have demonstrated that the PCIS complies with all Contract requirements.
    b) Acceptance of the PCIS Installation testing will be provided in writing by the Regional District before the performance testing may begin.
3. Functional Testing:
    a) Commence after acceptance of all training, wire test, calibration tests, and loop validation tests, and all inspections have demonstrated that the PCIS complies with all Contract requirements.
    b) Loop validation test.
        i. Notify the Regional District of scheduled tests a minimum of 21 days before the estimated completion date of installation and wiring of the PCIS.
        ii. Complete loop validation testing a minimum of five (5) days before the pre- commissioning phase of the project.
        iii. The Programmer will assist with Functional Testing.
        iv. The Programmer shall not be required to be on site, nor shall the Programmer be required to supply application software, until the loop validation tests are complete for a PLC and all prerequisites for the Process Operational Period are completed.
4. Provide all special tools and spare parts, as specified in the Maintenance paragraph of this Section, before Process Operational Period commences, suitably wrapped and identified.
5. Prior to shipping from the Integrator, the Integrator will troubleshoot and test in the presence of the Regional District, at the integrator’s factory, prior to shipping to the site, the fully functional and trouble-free control panel. The factory panel will not ship until authorized in writing by the Regional District.

1.7 SCHEDULING (NOT USED)

1.8 WARRANTY (NOT USED)

1.9 SYSTEM PROCESS START-UP

1. Replace or modify equipment, software, and materials that do not achieve design requirements after installation in order to attain compliance with the design requirements:
    a) Following replacement or modification, retest the system and perform additional testing to place the complete system in satisfactory operation and obtain compliance acceptance from the Engineer.

1.10 OWNER'S INSTRUCTIONS (NOT USED)

1.11 MAINTENANCE

1. Before Substantial Completion, perform all maintenance activities required by the Contract Documents including any calibrations, final adjustments, component replacements or other routine service required before placing equipment or systems in service.
2. Furnish all spare parts as required by the Contract Documents.
3. Provide additional spare parts specified in other sections of the Instrumentation and Control Specifications.
4. Submit all special tools and spare parts, suitably wrapped and identified, before Process Operational Period commences.

2.0 PRODUCTS

2.1 MANUFACTURERS

1. Provide similar items from a single manufacturer throughout the PCIS portion of the Project.
2. Allowable manufacturers are specified in individual instrument and equipment specifications.

2.2 EXISTING PRODUCTS (NOT USED)

2.3 MATERIALS

1. Furnish all materials under this Contract that are new, free from defects, and standard products produced by manufacturers regularly engaged in the production of these devices and that bear all approvals and labels as required by the Specifications.
2. Provide materials complying with the applicable industrial standard as specified in the Contract Documents.

2.4 MANUFACTURED UNITS (NOT USED)

2.5 EQUIPMENT (NOT USED)

2.6 COMPONENTS

1. Furnish all meters, instruments, and other components that are the most

recent field proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise specified to match existing equipment.

2. Unless otherwise specified, furnish individual instruments that have a minimum accuracy of within 0.5% of full scale and a minimum repeatability.
3. Signal transmission:
    a) Analog signals:
        i. Furnish analog measurements and control signals that vary in direct linear proportion to the measured variable, unless otherwise indicated.
        ii. Furnish electrical analog signals outside control panels that are four (4) to 20 milliamperes 24 VDC, except as indicated.
        iii. Analog signals within enclosures may be one (1) to five (5) VDC.
        iv. Electrically or optically isolate all analog signals from other signals.
        v. Furnish regulated analog signals that are not affected by changes in supply voltage or load resistance within the unit's rating.
        vi. Maintain the total four (4) to 20 milliamperes loop impedance to 10% below the published value at the loop operating voltage.
        vii. Where necessary, reduce loop impedance by providing current-to-current (I/I) isolation amplifiers for signal re-transmission.
4. Grounding:
    a) Provide control panels with a signal ground bus, isolated from the power ground bus:
        i. Provide multiple panels in one (1) location with a common point for signal ground bus connection to ground.
    b) Ground single point ground shields and measurement loops at the source panel external terminals, unless otherwise noted, by bonding to the control panel signal ground bus bar.

2.7 ACCESSORIES

1. Provide flow conditioning devices or other required accessories if necessary to meet the accuracy requirements in the Contract Documents.

2. Nameplates:
    a) Provide a nameplate for each controller, instrument transducer, instrument power supply, solenoid, or any other control device located either in the field or within panels.
    b) All nameplates shall be of identical style, color, and material throughout the facility.
    c) Device nameplates shall include:
        i. Designations as indicated on the Drawings and identified on the Process and Instrumentation Drawings.
            a. Device tag and loop number ID (e.g. FIT-60.011).
            b. Power information (e.g. PCM-11, 120VAC)
        ii. White lettering on a black background, laminated plastic.
    d) All instruments shall be equipped with Type 316 stainless steel nameplate with the instrument tag stamped in 3/8 inch letters and connected to the instrument using Type 316 stainless steel wire.

2.8 MIXES (NOT USED)

2.9 FABRICATION (NOT USED)

2.10 FINISHES (NOT USED)

2.11 SOURCE QUALITY CONTROL

1. Provide all equipment that is new, free from defects, and standard products produced by manufacturers regularly engaged in the production of these products that bear all approvals and labels as required by the Specifications.
2. Arrange with all manufacturers of the equipment and fabricators of panels and cabinets, to allow the Regional District and Engineer to inspect and witness the testing of the equipment at the site of fabrication:
    a) Equipment includes the cabinets, special control systems, flow measuring devices, and other pertinent systems and devices.

3.0 EXECUTION

3.1 EXAMINATION

1. Provide a complete instrumentation and control system:
    a) Install all extra conduits, cables, and interfaces as may be necessary to provide a complete and operating electrical, and process control and instrumentation system.

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

1. Existing equipment locations indicated on the Drawings may change due to

variations in equipment size or minor changes made by others during construction:

a) Verify all dimensions as indicated on the Drawings:

b) Contractor to field verify the location of all new equipment within the electrical control room.

   i. Actual field conditions govern all final installed locations, distances, and levels.

c) Review all information indicated on the Drawings, including architectural, structural, mechanical, instrumentation, and the accepted electrical, instrumentation, and mechanical Shop Drawings, and coordinate Work as necessary to adjust to all conditions that arise due to such changes.

d) Make minor changes in location of equipment before rough in, as directed by the Regional District or Engineer.

2. The PCIS configurations are diagrammatic:

   a) The locations of equipment are approximate unless dimensioned.

   b) Where Project conditions require, make reasonable changes in locations and arrangements.

3. Field instruments installation:

   a) Install field instruments as specified in the Contract Documents, API RP 550 and RP 551, and the Manufacturer's instructions.

   b) Mount field instruments so that they can be easily read, readily approached, and easily serviced, and so they do not restrict access to mechanical equipment:

      i. Mount field instruments on a pipe stand or local panel, if they are not directly mounted, unless otherwise indicated on the Drawings.

      ii. Provide sun shields for all field electronic instruments exposed to direct sunlight.

   c) Make connections from rigid conduit systems to field instruments with PVC coated flexible conduit.

   d) Connect field instruments with cable as specified in the Electrical Specifications, except when the manufacturer requires the use of special cable, or otherwise specified in this Section:

      i. Special cable applications shall be in accordance with the NEC.

   e) Verify the correctness of each installation:

      i. Polarity of electric power and signal connections.

ii. Ensure all process connections are free of leaks.

4. Conduit, cables, and field wiring:
    a) Provide all PCIS equipment cables, and process LAN communication networks under the Instrumentation and Control Specifications.
    b) Provide terminations and wire identification as specified in the Electrical Specifications.
    c) Protect all wiring from sharp edges and corners.
    d) Provide all conduits, fittings, boxes, etc. in accordance with all the requirements of the Electrical Specifications.
5. Equipment tie-downs:
    a) Anchor all instruments, control panels, and equipment by methods that comply with seismic and wind bracing requirements, which apply to the Site.
    b) All control panels, VCPs, LCPs, RTUs, PCMs, etc., shall be permanently mounted and tied down to structures.
6. Instrument tagging:
    a) As specified in Section 260553.
    b) Provide all field-mounted instruments with nameplates:
        i. Nameplates engraved with the instrument's full tag number as indicated on the Drawings:
            a. Affix tags with stainless steel wire fasteners.
    c) Provide all back of panel instruments with nameplates:
    d) Engraved with the instrument's full tag number as indicated on the Drawings:
    e) Provide all front of panel instruments with a nameplate:
    f) Provide all front of panel instruments with a nameplate:
        i. Engraving to include the following:
            a. Instrument's full tag number
            b. Service description.
        ii. Nameplates:
            a. Secure nameplates to the panel with stainless steel screws.
            b. Use an accepted adhesive if screws would violate the NEMA or other ratings of the enclosure.

7. Cable and conductor termination:
    a) Terminate all cables and conductors on terminal blocks.
    b) Terminal block enclosures:
        i. Suitable for the area classification.
8. Surge protection:
    a) Provide outdoor field instrument loops with voltage surge protection units installed on the instruments.
    b) Provide voltage surge protection for all wire transmitters and analyzers:
        i. Protect both power source and signal loop.

3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

3.5 REPAIR/RESTORATION (NOT USED)

3.6 RE-INSTALLATION (NOT USED)

3.7 COMMISSIONING AND PROCESS START-UP

1. Regional District Training:
    a) General:
        i. Provide system maintenance and operator training courses for all the instrumentation and control systems furnished.
        ii. Conduct all training at the Project Site unless another location is accepted by the Engineer and Regional District:
            a. Include instruction on the use of all maintenance equipment and special tools provided under the Contract.

3.8 FIELD QUALITY CONTROL

1. Inspection:
    a) Provide any assistance necessary to support inspection activities.
    b) Engineer inspections may include, but are not limited to, the following:
        i. Inspect equipment and materials for physical damage.
        ii. Inspect installation for compliance with Drawings and Specifications.
        iii. Inspect installation for obstructions and adequate clearances around equipment.
        iv. Inspect equipment installation for proper leveling, alignment, anchorage, and assembly.

v. Inspect equipment nameplate data to verify compliance with design requirements.

vi. Inspect cable terminations.

vii. Inspect/witness instrument calibrations/verifications.

2. Instrument Installation Inspection:

a) Provide any assistance necessary to support inspection activities.

b) Inspections may include, but are not limited to, the following:

i. Inspect equipment and materials for physical damage.

ii. Inspect the installed arrangement, lay lengths, orientation, piping obstructions etc. that could affect the instruments accuracy or repeatability.

iii. Inspect installation for compliance with Drawings and Specifications.

iv. Inspect installation for obstructions and adequate clearances around equipment.

v. Inspect equipment installation for proper leveling, alignment, anchorage, and assembly.

vi. Inspect equipment nameplate data to verify compliance with design requirements.

vii. Inspect cable terminations.

viii. Inspect/witness instrument calibrations/verifications.

3. Installation supervision:

a) Ensure that the entire PCIS is installed in a proper and satisfactory manner. At a minimum, the ICSC shall provide the following services:

i. Installation resources:

a. Coordinate with the Contractor regarding installation requirements of the Contract Documents.

ii. Provide technical assistance to installation personnel by telephone:

a. Furnish installation personnel with at least one (1) copy of the accepted submittals, including all installation details.

iii. Periodic inspections during the construction period.

iv. A complete check of the completed installation to ensure that it is in conformance with the requirements of the equipment manufacturer and the Contract Documents.

3.9 ADJUSTING (NOT USED)

3.10 CLEANING

1. Clean all panel surfaces.
2. Return to new condition any scratches and/or defects.
3. Wipe all instrument faces and enclosures clean.
4. Leave wiring in panels, manholes, boxes, and other locations in a neat, clean, and organized manner:
    a) Neatly coil and label all spare wiring lengths.
    b) Shorten, re-terminate, and re-label excessive spare wire and cable lengths, as determined by the Engineer.
5. As specified in other sections of the Contract Documents.

3.11 PROTECTION

1. Protect all Work from damage or degradation until date of Substantial Completion.

3.12 SCHEDULES (NOT USED)

END OF SECTION

Section 406700 Control Systems Equipment Panels and Racks

1.0 GENERAL

1.1 SUMMARY

1. Section includes:
    a) The Contractor shall design, engineer, fabricate and assemble all instrumentation enclosures and Variable frequency drive, complete with a DV/DT outlet filter, control panels and components provided under this contract, including but not limited to:
        i. Custom built instrumentation and control panels.
        ii. Control panels furnished as part of equipment systems specified in other Divisions, such as vendor control panels (VCPs) and chemical feed panels.
        iii. Control components.
        iv. Control panel installation.
        v. DV/DT outlet Filter

1.2 DEFINITIONS

1. As specified in Section 406100.
2. Specific definitions:
    a) The term “panel” in this Section is interchangeable with the term “enclosure.”

1.3 SYSTEM DESCRIPTION

1. Panel dimensions:
    a) It is the responsibility of the Contractor or manufacturer to design and size all panel and filed determine the location of the equipment panels:
        i. Size panels to provide space for all equipment, wiring, terminations, and other items in the panel, including space for future build out.
        ii. Panel sizes that substantially deviate (within 3 inches in any dimension) from the sizes indicated on the Drawings will be approved by the Engineer.
        iii. Maximum panel depth: 30 inches, unless otherwise indicated.
2. Structural design:

a) Enclosures an internal equipment shall be braced to prevent damage from forces.

1.4 SUBMITTALS

1. Provide submittals as specified in Sections 013300 and 406100.
2. Provide a control panel hardware submittal for each control panel and enclosure being provided on this project, including but not limited to:
    a) Product data:
        i. Enclosure construction details and NEMA 4X type.
        ii. Manufacturer's literature and specification data sheets for each type of equipment to be installed within or on the panel or enclosure.
    b) Shop Drawings:
        i. Scaled, detailed exterior panel (front and side views) and interior panel layout showing equipment arrangement and dimensional information:
            a. Provide draft for review and approval by the Regional District.
            b. Complete nameplate engraving schedule.
            c. Dimensions of the enclosure in inches.
            d. Maximum allowable temperature inside the enclosure, based on the lowest operating temperature limit of the installed components.

1.5 QUALITY ASSURANCE

a) As specified in Section 406100.

b) Assemble panels, enclosures, and rack systems along with all internal and external devices, wiring, equipment, and materials in a facility that is recognized by UL to assemble and certify UL-and CSA labeled control panels:

i. Provide all components and equipment with UL508 or CSA listing.

ii. All control panels shall be UL508 Aor CSA label, unless the equipment in the panel and the design in the contract documents cannot be reasonably modified to meet the requirements for UL 508A or CSA labeling.

iii. Provide fuses for all equipment that is not UL, CSA or UR

listed.

1.6 DELIVERY, STORAGE, AND HANDLING

1. Project environmental conditions as specified in Section 406100.
2. Provide instruments suitable for the installed site conditions including, but not limited to, material compatibility, site altitude, site seismic conditions, humidity, and process and ambient temperatures. All panels shall be UL or CSA certified panels.

1.7 SEQUENCING (NOT USED)

1.8 SCHEDULING (NOT USED)

1.9 WARRANTY

1. As specified in Section 406100.
2. System start-up Regional District's instructions
    a) The Contractor shall be responsible for the design, coordination with the Contractor's electrical engineer, for fabrication, delivery, installation of CONTROL EQUIPMENT PANELS and RACKS.

1.10 COMMISSIONING

1. A successful Commissioning shall be completed by the Contractor upon successful completion of an uninterrupted 48-hour continuous fault free automatic start up, testing, and operation of the entire Chaster well improvements. Should any fault or error occur, the time will be restarted back to zero and the entire Commissioning process will start again until a continuous 48-hour fault free automated functioning of the well improvements has been accomplished by the Contractor. The Regional District's Engineer of Record shall make the final determination on when the Commissioning has been successfully completed and will notify the Contractor in writing when the Commissioning has been successfully completed.

1.11 MAINTENANCE (NOT USED)

2.0 PRODUCTS

2.1 MATERIALS

1. Construct and finish enclosures using materials capable of withstanding the mechanical, electrical, and thermal stresses, as well as the effects of humidity and corrosion that are likely to be encountered in normal service:
    a) Enclosures shall have the following properties:

i. NEMA Type 4X: Type 316 stainless steel with watertight gasketed door.

2. Bolting material:

a) Commercial quality ½ inch diameter, stainless steel hex-head Grade 5 bolts, nuts, and washers, with unified coarse (UNC) threads.

b) Carriage bolts for attaching end plates.

c) All other bolted joints shall have S.A.E. standard lock washers.

2.2 MANUFACTURED UNITS

1. Panels/enclosures:

a) Manufacturer: one (1) of the following or equal:

i. Rittal.

ii. Pentair (formerly Hoffman Engineering).

iii. Saginaw Control & Engineering.

b) Panel assembly:

i. General guidelines for panel fabrication include:

a. Continuous welds ground smooth.

b. Exposed surfaces free of burrs and sharp edges.

c. Base formed of heavy channel iron, either galvanized or powder coated, minimum ½ inch holes at 12 inches spacing to accommodate anchoring of freestanding enclosures to floor.

ii. Construct enclosure and mounting panel using stretcher-level quality sheet metal having minimum thickness not less than the following sizes (U.S. Standard Gauge):

Enclosure Height (inches)	Minimum Enclosure Steel Thickness (gauge)	Minimum Back Mounting Panel Thickness (gauge)
Wall-mounted up to	14	14
Up to 57	12	12
57 - 69	12	10
69 - 82	12, except 10 on back	10

82 or more	10	10

a. Use heavier sheet metal to meet seismic requirements at the Site or when required due to equipment requirements.

iii. Construct supporting frame structure with angled, channeled, or folded rigid section of sheet metal, rigidly attached to and having essentially the same outer dimensions as the enclosure surface and having sufficient torsional rigidity to resist the bending moments applied via the enclosure surface when it is deflected.

iv. Provide stiffeners for back mounting panels in enclosures larger than 4 feet. In addition, secure the panels in place by collar studs welded to the enclosure.

v. Door construction:

a. Turned-back edges suitably braced and supported to maintain alignment and rigidity without sagging.

b. Sufficient width to permit door opening without interference with rear projection of flush-mounted instruments.

c. Heavy-gauge piano-type continuous stainless-steel hinges.

d. For NEMA Type 4X, provide oil-resistant neoprene sealing gasket and adhesive to seal cover to enclosure.

e. Gasket installed to seal against roll lip on the enclosure opening.

vi. Latches:

a. For panels, provide each door with a 3-point latching mechanism and locking handle with rollers on the ends of the latch rods. Latch rods shall be connected to a common door handle, hold doors securely, and form a compressed seal between door and gasket, at the top, side, and bottom.

- Provide padlock for each enclosure with padlock provisions.

b. Include an oil-tight key-locking, 3-point latching

mechanism on each door:

- Provide two (2) keys per panel.
- All locks keyed alike.

vii. For large NEMA Type 4X cabinets not available with 3-point latching hardware, provide multiple clips and padlock hasps. Panel cut-outs:

a. Cut, punch, or drill cutouts for instruments, devices, and windows. Smoothly finish with rounded edges.

b. Allow a minimum of 3 inch envelope around all displays, controllers, and monitors.

c. Reinforce around cut-outs with steel angles or flat bars for the following:

- Large panel cutouts; for example, openings for local operator interfaces.
- Pilot device groupings, where the removed metal exceeds 50% of the available metal.

2. Arrangement of components:

a) Arrange panel internal components for external conduit and piping to enter into panel either from above or below.

b) Arrange panel instruments and control devices in a logical configuration, associating pushbutton and selector switches with related readout devices, or as indicated on the Contract Drawings.

c) Mount internal control components on an internal back panel. Devices may be mounted on the side panel only by special permission from the Engineer.

d) All control-panel-mounted operator interface devices shall be mounted between 3 feet and 5 feet above finished floor.

3. Overcurrent protection:

a) Main overcurrent device:

i. Where the electrical power supply voltage to the control panel is more than 120 VAC, provide the panel with a flange-mounted disconnect handle operating a molded-case circuit breaker and provide a control power transformer for 120-VAC circuits:

a. Door-mounted disconnect handles are not

acceptable.

b. Mechanically interlock the disconnect switch with the control enclosure doors so that no door can be opened unless the power is disconnected, and the disconnect switch cannot be closed until all doors are closed.

c. Provide means to defeat the interlock.

d. Lockable in the off position.

ii. Control panels supplied with 120 VAC:

a. Provide an internal breaker with the line side terminals covered by a barrier.

b. Provide a nameplate prominently positioned on the control panel identifying the location of the power source and a warning statement requiring the source to be disconnected before opening the door to the enclosure.

b) Selection and ratings of protective devices:

i. Interrupting ratings: Not less than the system maximum available fault current at the point of application.

ii. Voltage rating: Not less than the voltage of the application.

iii. Select current rating and trip characteristics to be suitable for:

a. Maximum normal operating current.

b. Inrush characteristics.

c. Coordination of the protective devices to each other and to the source breaker feeding the panel.

c) Provide a separate protective device for each powered electrical device:

i. An individual circuit breaker for each 120-VAC instrument installed within its respective control panel and clearly identified for function.

ii. An individual fuse for each PLC discrete output. Provide with individual blown fuse indication external of the I/O card:

a. Size external fuse to open before any I/O-card-

mounted fuses.

iii. An individual 5-ampere fuse for each discrete input loop.

iv. An individual ½ ampere fuse for each four (4) to 20 milliamperes analog loop powered from the control panel.

v. Install protective devices on the back mounting panel and identify by a service nameplate in accordance with the wiring diagrams.

d) Fuses for four (4) to 20 milliamperes signals:

i. Provide durable, readily visible label for each fuse, clearly indicating the correct type, size, and ratings of replacement fuse:

a. Label shall not cover or interfere with equipment Manufacturer's instructions.

ii. Provide fuses rated for the voltage and available short-circuit current at which they are applied.

iii. Manufacturer: one (1) of the following or equal:

a. Bussmann.

e) Fuse holders:

i. Modular type:

a. DIN rail mounting on 35-millimeter rail.

b. Touch-safe design: All connection terminals to be protected against accidental touch.

c. Incorporates blown-fuse indicator.

ii. Provide nameplate identifying each fuse:

a. As specified in Section 260553.

iii. Manufacturer: one (1) of the following or equal:

a. Phoenix Contact.

b. Allen-Bradley 1492-FB Series B.

f) Control circuit breakers:

i. DIN rail mounting on 35-millimeter rail.

ii. Manual OPEN-CLOSE toggle switch.

iii. Rated for 250 VAC.

iv. Interrupting rating: 10 kiloampere (kA) or available fault current at the line terminal, whichever is higher.

v. Current ratings: As indicated on the Contract Drawings or as required for the application.

vi. Provide nameplate identifying each circuit breaker:

a. As specified in Section 260553.

vii. Manufacturer: one (1) of the following or equal:

a. Phoenix Contact.

4. Conductors and cables:

a) Power and control wiring:

b) Materials: Stranded, soft annealed copper.

c) Insulation: 600 volts type MTW.

i. Minimum sizes:

a. Primary power distribution: 12 AWG.

b. Secondary power distribution: 14 AWG.

c. Control: 16 AWG.

ii. Color:

a. AC power (line and load): Black.

b. AC power (neutral): White.

c. AC control: Red.

d. DC power and control (ungrounded): Blue.

e. DC power and control (grounded): White with Blue stripe.

f. Ground: Green.

d) Signal cables:

i. Materials: Stranded, soft annealed copper.

ii. Insulation: 600 volts, PVC outer jacket.

iii. Minimum size: 18 AWG paired triad.

iv. Overall aluminum shield (tape).

v. Copper drain wire.

vi. Color:

a. 2-Conductor:
    - Positive (+): Black.
    - Negative (-): White and red.
b. 3-Conductor:
    - Positive (+): Black.
    - Negative (-): Red.
    - Signal: White.

vii. Insulate the foil shielding and exposed drain wire for each signal cable with heat-shrink tubing.

5. Conductor identification:
    a) Identify each conductor and cable with unique wire numbers as specified in Section 260553.
    b) Readily identified without twisting the conductor.
6. General wiring requirements:
    a) Wiring methods: Wiring methods and materials for panels shall be in accordance with the NEC requirements for General Purpose (no open wiring) unless otherwise specified.
    b) Install all components in accordance with the Manufacturer's instructions included in the listing and labeling.
    c) Provide a nameplate on the cover of the control panel identifying all sources of power supply and foreign voltages within the control panel.
    d) Provide transformers, protective devices, and power supplies required to convert the supply voltage to the needed utilization voltage.
    e) Provide power surge protection for all control panels.
    f) Provide signal surge protection within control panels for each analog I/O, discrete I/O, and data line (Copper Ethernet, Coax, Fieldbus signals) that originates from outdoor devices.
    g) Provide non-metallic ducts for routing and organization of conductors and cables:
        i. Provide wiring separation plan.
        ii. Size ducts for ultimate build-out of the panel, or for 20% spare, whichever is greater.

iii. Provide separate ducts for signal and low-voltage wiring from power and 120-VAC control wiring:

h) Cables shall be fastened with cable-mounting clamps or with cable ties supported by any of the following methods:

i. Screw-on cable tie mounts.

ii. Hammer-on cable-tie mounting clips.

iii. Fingers of the non-metallic duct.

i) Wire Ties:

i. No wire ties inside wire duct.

ii. Use Panduit Cable tie installation tool, with tension control/cutoff.

iii. Verify cut ends are cut flush filed smooth after installed.

j) Provide supports at the ends of cables to prevent mechanical stresses at the termination of conductors.

k) Support panel conductors where necessary to keep them in place.

l) Wiring to rear terminals on panel-mount instruments shall be run in non-metallic duct secured to horizontal brackets run adjacent to the instruments.

m) Conductors and cables shall be run from terminal to terminal without splice or joints. Exceptions:

i. Factory-applied connectors molded onto cables shall be permitted. Such connectors shall not be considered as splices or joints.

n) The control panel shall be the source of power for all 120-VAC devices interconnected with the control panel including, but not limited to:

i. Solenoid valves.

ii. Instruments both mounted in the control panel and remotely connected to the control panel.

2.3 EQUIPMENT (NOT USED)

2.4 COMPONENTS

1. Thermal management:

a) Provide heating, cooling, and dehumidifying devices in order to maintain all instrumentation and control devices to within a range

as specified in Section 406100.

2. Enclosure temperature switch:
    a) Provide wall-mounted bimetallic switch transmitter (to measure internal cabinet temperature in all enclosures) containing electrical components such as PLCs, RTUs, RIO, and VFDs.
        i. Sensor and electronic enclosure.
        ii. Accuracy: Within two (2) degrees Fahrenheit.
        iii. Manufacturer: The following or equal:
            a. Hoffman ATEMNC.
            b. Pfannenberg FLZ.
            c. Hammond Manufacturing.
    b) Fan ventilation:
        i. Provide Hoffman or equivalent fan speed control:
            a. Provide two (2) door/cabinet-mounted vent fans for every 72 inches of cabinet width.
            b. Provide finger-guard kit.
            c. Filter kit with two (2) spare filters for each intake fan.
            d. Provide bezel and gasket kit.

2.5 PILOT DEVICES:

1. General:
    a) Provide operator pushbuttons, switches, and pilot lights, from a single Manufacturer.
    b) Size:
        i. 30.5 millimeters.
    c) Heavy duty.
    d) Pushbuttons:
        i. Contacts rated:
            a. NEMA Type A600.
        ii. Furnish one (1) spare normally open contact and normally closed contact with each switch.

e) Selector switches:
    i. Contacts rated:
        a. NEMA Type A600.
        b. Knob type.
    ii. Furnish one (1) spare normally open contact and normally closed contact with each switch.
    iii. Provisions for locking in the off position where lockout provisions are indicated on the Contract Drawings.

f) Pilot lights:
    i. Type:
        a. LED for interior installations.
    ii. Push to test.
    iii. Lamp color:
        a. On/Running/Start: Red.
        b. Off/Stop: Green.
        c. Power: White.
        d. Alarm: Amber.
        e. Status or normal condition: White.
        f. Opened: Amber.
        g. Closed: Blue.
        h. Failure: Red.

2. Indoor and outdoor areas:
    a) NEMA Type 4X.
    b) Manufacturer: one (1) of the following or equal:
        i. Allen-Bradley Type 800T.
        ii. Square D Class 9001, Type K.
        iii. General Electric Type CR104P.
        iv. IDEC TWTD Series.
    c) Potentiometer and slidewire transmitters:
        i. Provide a DC output in proportion to a potentiometer input.
        ii. Potentiometer input:

a. 100 ohms to 100 K ohms.
b. Impedance Greater or equal to 1 M ohms.
c. Zero turn-up: 80% of full-scale input.
d. Span turn-down: 80% of full-scale input.

d) Field-configurable output:
   i. Voltage and current: All conventional current loops and voltage control signals.
e) Accuracy including linearity and hysteresis within 0.1% maximum at 25 degrees Celsius.
f) Operating temperature: 0 to 55 degrees Celsius.
g) Supply power: 9 to 30 VDC.
h) Manufacturer: The following or equal:
   i. Phoenix Contact.

2.6 RELAYS:

1. General:
   a) For all types of 120-VAC relays, provide surge protection across the coil of each relay.
   b) For all types of 24-VDC relays, provide a free-wheeling diode across the coil of each relay.
2. General purpose:
   a) Magnetic control relays.
   b) NEMA Type A300 rated:
      i. 300 volts.
      ii. 8 Amps continuous (minimum).
      iii. 7,200 volt-amperes make.
      iv. 720 volt-amperes break.
   c) Plug-in type.
   d) LED indication for energization status.
   e) Coil voltages: As required for the application.
   f) Minimum poles: Double Pole Double Throw Contactor (DPDT).
   g) Touch-safe design: All connection terminals to be protected

against accidental touch.

h) Enclose each relay in a clear plastic heat and shock-resistant dust cover.

i) Quantity and type of contact shall be as indicated on the Drawings or as needed for system compatibility.

j) Relays with screw-type socket terminals.

k) Provide additional (slave/interposing) relays when the following occurs:

i. The number or type of contacts shown exceeds the contact capacity of the specified relays.

ii. Higher contact rating is required in order to interface with starter circuits or other equipment.

l) DIN rail mounting on 35-millimeter rail.

m) Ice-cube-type relays with retainer clips to secure relay in socket.

n) Integrated label holder for device labeling.

o) Manufacturer: one (1) of the following or equal:

i. Phoenix Contact PLC Series.

ii. Potter and Brumfield Type KRP or KUP.

iii. IDEC R* Series (* = H, J, R, S, U).

iv. Allen-Bradley Type 700 HC.

v. Square D Type K.

3. Latching:

a) Magnetic-latching control relays.

b) NEMA Type B300 rated:

a. 300 volts.

b. 10 Amps continuous.

c. 3,600 volt-amperes make.

d. 320 volt-amperes break.

c) Plug-in type.

d) DIN rail mounting on 35-millimeter rail.

e) Coil voltage: As required for the application.

f) Minimum poles: two (2) pole double toggle (PDT) as required for the application. Plus one (1) spare pole.

g) Touch-safe design: All connection terminals to be protected against accidental touch.

h) Clear cover for visual inspection.

i) Provide retainer clip to secure relay in socket.

j) Manufacturer: one (1) of the following or equal:

i. Square D 8501, Type K.

ii. IDEC TWTD Series.

4. Time delay:

a) Provide time-delay relays to control contact transition time.

b) Contact rating:

i. 240 volts.

ii. 10 Amps continuous.

iii. 3,600 volt-amperes make.

iv. 360 volt-amperes break.

c) Coil voltage: As required for the application.

d) Provide pneumatic or electronic type with on-delay, off-delay, and on/off- delay:

i. For off-delay, use true power-off time-delay relays. Where the required timing range exceeds capability of the off-delay relay use, signal off-delay where power loss will not cause undesirable operation or pneumatic time-delay relays.

e) Minimum poles: Two (2) PDT.

f) Units include adjustable dial with graduated scale covering the time range in each case.

g) Minimum timing range: 0.1 seconds to 10 minutes, or as required for the application.

h) Manufacturer: one (1) of the following or equal:

i. IDEC RTE Series or equivalent

ii. Agastat Series 7000 (pneumatic).

iii. Allen-Bradley Type 700-HR.

5. Terminal blocks:
    a) DIN rail mounting on 35-millimeter rail.
    b) Suitable for specified AWG wire.
    c) Rated for 15 amperes at 600 volts.
    d) Screw terminal type.
    e) Provide mechanism to prevent wire connection from loosening in environments where vibration is present. This mechanism shall not cause permanent deformation to the metal body.
    f) Finger-safe protection for all terminals for conductors.
    g) Construction: Polyamide insulation material capable of withstanding temperature extremes from - 40 to 105 degrees Celsius.
    h) Terminals: Plainly identified to correspond with markings on the diagrams:
        i. Permanent machine-printed terminal identification.
    i) Disconnect-type field signal conductor terminals with socket/screw for testing.
    j) Identify terminals suitable for use with more than one (1) conductor. Position:
        i. So that the internal and external wiring does not cross.
        ii. To provide unobstructed access to the terminals and their conductors.
    k) Provide minimum 25% spare terminals.
    l) Manufacturer: one (1) of the following or equal:
        i. Phoenix Contact UK5 Series.
        ii. Allen-Bradley 1492 Series.
6. Wire duct:
    a) Provide flame retardant plastic wiring duct, slotted with dust cover.
    b) Type:
        i. Wide slot.
        ii. Narrow slot.
        iii. Round hole.

c) Manufacturer: the following or equal:

i. Panduit.

7. Din Rail:

a) Perforated Steel.

b) 35mm width.

c) 15mm deep.

d) Provide 2 inch offset using one (1) of the following:

i. Offset brackets.

ii. Preformed standoff DIN Rail Channel.

8. Surge protection devices:

a) Control panel power:

i. 120-volt control power source: Non-UPS powered:

a. Provide surge protection device (SPD) for panel power entrances:

- Nominal 120-VAC with a nominal clamping voltage of 200 volts.
- Non-faulting and non-interrupting design.
- A response time of not more than five (5) nanoseconds.

b. Control panel power system level protection, non-UPS powered:

- Designed to withstand a maximum 10-kA test current of a 8/20 µs waveform according to IEEE C62.41.1 Category C Area.
- For panels receiving power at 120 VAC, provide surge protection at secondary of main circuit breaker.
- Provide both normal mode noise protection (line to neutral) and common mode (neutral to ground) surge protection.
- DIN rail mounting.
- Attach wiring to the SPD by means of a screw-type cable- clamping terminal block:

- Gas-tight connections.
- The terminal block: Fabricated of non-ferrous, non-corrosive materials.

- Visual status indication of MOV status on the input and output circuits.
- Dry contact rated for at least 250 VAC, 1 Amp for remote status indication.
- Meeting the following requirements:
  - Response time: Less than or equal to 100 nanoseconds.
  - Attenuation: Greater than or equal to -40 dB at 100 kilovolt-Hertz as determined by a standard 50-ohm insertion test.
  - Safety approvals:
    - UL 1283 (EMI/RFI Filter).
    - UL 1449 2nd Edition.
- Manufacturer: one (1) of the following or equal:
  - Phoenix Contact Type SFP TVSS/Filter.
  - Liebert Accuvar Series.
  - Islatrol.

b) Instrument, data, and signal line protectors (traditional I/O) – panel mounted:

i. Surge protection minimum requirements: Withstand a 10-kA test current of a 8/20 µs waveform in accordance with IEEE C62.41.1 Category C Area.

ii. DIN rail mounting on 35-millimeter rail (except field-mounted SPDs).

iii. SPDs consisting of two (2) parts:

a. A base terminal block.

b. A plug protection module:

- Replacing a plug shall not require the removal of any wires nor interrupt the signal.

- Base and plug coded to accept only the correct voltage plug.

iv. SPD Manufacturer: one (1) of the following or equal:

a. Phoenix Contact Plugtrab Series.

b. Bournes Series 1800.

c) Instrument, data, and signal line protectors (traditional I/O) – field mounted:

i. Surge protection minimum requirements: Withstand a minimum 10-kA test current of 8/20 µs waveform in accordance with IEEE C62.41.1 Category C Area.

ii. Manufacturer: one (1) of the following or equal:

a. Plugtrab PT Series.

b. MTL TP48 Series.

9. Variable frequency drives:

a) As specified in Section 262923.

10. Limit switches:

a) NEMA.

b) AC contact rating 120 volts, 10 A.

c) DC contact rating 125 volts, 0.4 A.

d) Provide robust actuation mechanism not prone to degradation.

e) Provide complete actuator mechanism with all required hardware.

f) Allows for contact opening even during contact weld condition.

g) UL approved.

h) Operating temperature range: -18 to +110 degrees Celsius.

i) Manufacturer: one (1) of the following or equal:

i. Allen-Bradley 802 Series.

ii. Honeywell HDLS Series.

iii. Omron D4 Series.

iv. Eaton E47, E49, E50.

v. ABB.

2.7 ACCESSORIES

1. As specified in Section 406100.
2. Provide panels with an inside protective pocket to hold the Panel Drawings. Ship panels with one (1) copy of accepted Shop Drawings including, but not limited to, schematic diagram, connection diagram, and layout drawing of control wiring and components in a sealed plastic bag stored in the panel drawing pocket.
3. Provide 15-inch floor stands or legs where needed or as indicated on the Contract Drawings.
4. Provide nameplate to each panel as indicated on the Contract Drawings:
    a) Provide as specified in Section 260553 on all internal and external instruments and devices.
    b) Provide a nameplate with the following markings that is plainly visible after installation:
        i. Manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the panel can be identified.
        ii. Supply voltage, phase, frequency, and full-load current.
        iii. Power source or circuit ID.
        iv. Short-circuit current rating of the panel based on one (1) of the following:
            a. Short-circuit current rating of a listed and labeled assembly.
            b. Short-circuit current rating established utilizing an approved method.
    c) Provide enclosures with a flange-mounted disconnect that is interlocked with the doors.
5. Lighting:
    a) Provide one (1) luminaire for each section, on the interior of the panel, spaced evenly along the top-front of the enclosure door opening(s):
        i. Covered or guarded.
        ii. Provide on-off door-activated switches where indicated on the Contract Drawings.
        iii. 120-volt, single-phase, 15-amp style plug.

iv. Provide 4,000 K, 900 Lumens – LED fixture.

a. Provide additional fixtures for every 36 inches of width.

6. Grounding:

a) Provide the following:

i. Grounding strap between enclosure doors and the enclosure.

ii. Equipment grounding conductor terminals.

iii. Provide equipment ground bus with lugs for connection of all equipment grounding wires.

iv. Bond multi-section panels together with an equipment grounding conductor or an equivalent grounding bus.

b) Identify equipment grounding conductor terminals with the word “GROUND,” the letters “GND,” the letter “G,” or the color green.

c) Ensure the continuity of the equipment grounding system by effective connections through conductors or structural members.

d) Provide an equipment-grounding terminal for each incoming power circuit, near the phase conductor terminal.

e) Size ground wires in accordance with NEC and UL Standards, unless noted otherwise.

f) Connect all exposed, noncurrent-carrying conductive parts, devices, and equipment to the equipment-grounding circuit.

g) Connect the door stud on the enclosures to an equipment-grounding terminal within the enclosure using an equipment-bonding jumper.

2.8 MIXES (NOT USED)

2.9 FABRICATION (NOT USED)

2.10 FINISHES

1. Finishes:

2.11 Metallic

1. All panel will be stainless steel finish inside and out. Metal surfaces of panels shall be prepared by chemical cleaning and mechanical abrasion in accordance with the finish Manufacturer’s recommendations to achieve a smooth, well-finished surface.

2.12 SOURCE QUALITY CONTROL

1. As specified in Section 406100.

3.0 EXECUTION

3.1 EXAMINATION

1. Examine the installation location for the instrument and verify that the instrument will Work properly when installed.
    a) Notify the Engineer promptly if any installation condition does not meet the instrument Manufacturer's recommendations or specifications.

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

1. Install enclosures so that their surfaces are plumb and level within 1/8 inch over the entire surface of the panel; anchor securely to wall and structural supports at each corner, minimum.
2. Install the enclosure per guidelines and submitted installation instructions to meet the seismic requirements at the Site.
3. Provide floor stand kits for wall-mounted enclosures larger than 48 inches high.
4. Provide 3 1/2 inch high concrete housekeeping pads for freestanding enclosures.
5. Install gasket and sealing material under panels with floor slab cutouts for conduit:
    a) Undercoat floor-mounted panels.
6. Provide a full-size equipment-grounding conductor in accordance with NEC included with the power feeder. Terminate to the incoming power circuit-grounding terminal.
7. All holes for field conduits, etc. shall be cut in the field. There shall be no additional holes, factory cut holes, or hole closers allowed. Incorrect holes, additional holes, or mis-cut holes shall require that the entire enclosure be replaced.
8. Side Panels:
    a) Side panels shall be kept free off all control equipment and devices. Any deviation will be sent to the engineer in writing asking for a deviation.

3.4 ERECTION, INSTALLATION, APPLICATION, AND CONSTRUCTION (NOT USED)

3.5 REPAIRS/RESTORATION (NOT USED)

3.6 RE-INSTALLATION (NOT USED)

3.7 FIELD QUALITY CONTROL

1. As specified in Section 406100.

3.8 ADJUSTING (NOT USED)

3.9 CLEANING

1. As specified in Section 406100.

3.10 DEMONSTRATION AND TRAINING (NOT USED

1. The Contractor shall demonstrate in the presence of the Engineer at the Integrator's place of business in the presence of the Regional District an error free simulation of the Contractor panels. The control panels will not ship until the Regional District has confirmed in writing the authorization to ship to the Site.

3.11 PROTECTION

1. As specified in Section 406100.

3.12 SCHEDULES (NOT USED)

END OF SECTION

SECTION: 409700 VARIABLE FREQUENCY DRIVES AND CONTROL PANELS

1.0 GENERAL

1.1 SUMMARY

1. Section includes:
    a) The Contractor shall design, engineer, fabricate and assemble all instrumentation enclosures and Variable frequency drive, DV/DT outlet filter, control panels and components provided under this Contract, including but not limited to:
        i. Custom built instrumentation and control panels.
        ii. Control panels furnished as part of equipment systems specified in other Divisions, such as Vendor Control Panels (VCPs) and chemical feed panels.
        iii. Control components.
        iv. Control panel installation.

1.2 DEFINITIONS

1. As specified in Section 406100.
2. Specific definitions:
    a) The term “panel” in this Section is interchangeable with the term “enclosure.”

1.3 SYSTEM DESCRIPTION

1. Panel dimensions:
    a) It is the responsibility of the Contractor or Manufacturer to design and size all panels and must determine the location of the equipment panels in conjunction with the Regional District:
        i. Size panels to provide space for all equipment, wiring, terminations, and other items in the panel, including space for future build out.
        ii. Panel sizes that substantially deviate (within 3) inches in any dimension) from the sizes indicated in the Contract Drawings will be reviewed by the Regional District.
        iii. Maximum panel depth: 30 inches, unless otherwise indicated.

2. Structural design:
    a) Enclosures an internal equipment shall be braced to prevent damage from forces.

1.4 SUBMITTALS

1. Provide submittals as specified in Sections 013300 and 406100.
2. Provide a control panel hardware submittal for each control panel and enclosure being provided on this project, including but not limited to:
    a) Product data:
        i. Enclosure construction details and NEMA Type 4X.
        ii. Manufacturer's literature and specification data sheets for each type of equipment to be installed within or on the panel or enclosure.
    b) Shop Drawings:
        i. Scaled, detailed exterior panel (front and side views) and interior panel layout showing equipment arrangement and dimensional information:
            a. Provide draft for review and approval by the Regional District.
            b. Complete nameplate engraving schedule.
            c. Dimensions of the enclosure in inches.
            d. Maximum allowable temperature inside the enclosure, based on the lowest operating temperature limit of the installed components.

1.5 QUALITY ASSURANCE

1. As specified in Section 406100.
2. Assemble panels, enclosures, and rack systems along with all internal and external devices, wiring, equipment, and materials in a facility that is recognized by UL to assemble and certify UL-and CSA labeled control panels:
    a) Provide all components and equipment with UL508 or CSA listing.
    b) All control panels shall be UL508 or CSA label, unless the equipment in the panel and the design in the Contract Documents cannot be reasonably modified to meet the requirements for UL 508A or CSA labeling.

3. Provide fuses for all equipment that is not UL, CSA or UR listed.

1.6 DELIVERY, STORAGE, AND HANDLING

1. Project environmental conditions as specified in Section 406100.
2. Provide instruments suitable for the installed site conditions including, but not limited to, material compatibility, Site altitude, Site seismic conditions, humidity, and process and ambient temperatures. All panels shall be UL or CSA certified panels.

1.7 SEQUENCING (NOT USED)

1.8 SCHEDULING (NOT USED)

1.9 WARRANTY

1. As specified in Section 406100.

1.10 SYSTEM START-UP (NOT USED)

1.11 REGIONAL DISTRICT'S INSTRUCTIONS

1. The Contractor shall be responsible for the design, coordination with the Contractor's electrical engineer, for fabrication, delivery, installation of Control Equipment Panels and Racks

1.12 COMMISSIONING (NOT USED)

1.13 MAINTENANCE (NOT USED)

2.0 PRODUCTS

2.1 MATERIALS

1. Construct and finish enclosures using materials capable of withstanding the mechanical, electrical, and thermal stresses, as well as the effects of humidity and corrosion that are likely to be encountered in normal service:
    a) Enclosures shall have the following properties:
        i. NEMA Type 4X: Type 316 stainless steel.
    b) Bolting material:
        i. Commercial quality ½ inch diameter, stainless steel hex-head Grade 5 bolts, nuts, and washers, with unified coarse (UNC) threads.
        ii. Carriage bolts for attaching end plates.
        iii. All other bolted joints shall have S.A.E. standard lock washers.

2.2 MANUFACTURED UNITS

1. Panels/enclosures:
    a) Manufacturer: one (1) of the following or equal:
        i. Rittal.
        ii. Pentair (formerly Hoffman Engineering).
        iii. Saginaw Control & Engineering.
    b) Panel assembly:
        i. General guidelines for panel fabrication include:
            a. Continuous welds ground smooth.
            b. Exposed surfaces free of burrs and sharp edges.
            c. Base formed of heavy channel iron, either galvanized or powder coated, minimum 1/2 inch holes at 12 inch spacing to accommodate anchoring of freestanding enclosures to floor.
        ii. Construct enclosure and mounting panel using stretcher-level quality sheet metal having minimum thickness not less than the following sizes (U.S. Standard Gauge):

Enclosure Height (inches)	Minimum Enclosure Steel Thickness (gauge)	Minimum Back Mounting Panel Thickness (gauge)
Wall-mounted up to	14	14
Up to 57	12	12
57 – 69	12	10
69 – 82	12, except 10 on back	10
82 or more	10	10

            a. Use heavier sheet metal to meet seismic requirements at the Site or when required due to equipment requirements.
        iii. Construct supporting frame structure with angled, channeled, or folded rigid section of sheet metal, rigidly attached to and having essentially the same outer dimensions as the enclosure surface and having sufficient torsional rigidity to resist the bending moments applied via the enclosure surface when it is deflected.

iv. Provide stiffeners for back mounting panels in enclosures larger than 2 feet. In addition, secure the panels in place by collar studs welded to the enclosure.

v. Door construction:

a. Turned-back edges suitably braced and supported to maintain alignment and rigidity without sagging.

b. Sufficient width to permit door opening without interference with rear projection of flush-mounted instruments.

c. Heavy-gauge piano-type continuous stainless-steel hinges.

d. For NEMA Type 4X, provide oil-resistant neoprene sealing gasket and adhesive to seal cover to enclosure.

e. Gasket installed to seal against roll lip on the enclosure opening.

vi. Latches:

a. For panels, provide each door with a 3-point latching mechanism and locking handle with rollers on the ends of the latch rods. Latch rods shall be connected to a common door handle, hold doors securely, and form a compressed seal between door and gasket, at the top, side, and bottom.

- Provide padlock for each enclosure with padlock provisions.
- Include an oil-tight key-locking, 3-point latching mechanism on each door:
  - Provide two (2) keys per panel.
  - All locks keyed alike.

vii. For large NEMA Type 4X cabinets not available with 3-point latching hardware, provide multiple clips and padlock hasps. Panel cut-outs:

a. Cut, punch, or drill cutouts for instruments, devices, and windows. Smoothly finish with rounded edges.

b. Allow a minimum of 3 inch envelope around all displays, controllers, and monitors.

c. Reinforce around cut-outs with steel angles or flat bars for the following:

- Large panel cutouts; for example, openings for local operator interfaces.
- Pilot device groupings, where the removed metal exceeds 50% of the available metal.

2. Arrangement of components:

a) Arrange panel internal components for external conduit and piping to enter into panel either from above or below.

b) Arrange panel instruments and control devices in a logical configuration, associating pushbutton and selector switches with related readout devices, or as indicated on the Contract Drawings.

c) Mount internal control components on an internal back panel. Devices may be mounted on the side panel only by special permission from the Engineer.

d) All control-panel-mounted operator interface devices shall be mounted between 3 feet and 5 feet above finished floor.

3. Overcurrent protection:

a) Main overcurrent device:

i. Where the electrical power supply voltage to the control panel is more than 120 VAC, provide the panel with a flange-mounted disconnect handle operating a molded-case circuit breaker and provide a control power transformer for 120-VAC circuits:

a. Door-mounted disconnect handles are not acceptable.

b. Mechanically interlock the disconnect switch with the control enclosure doors so that no door can be opened unless the power is disconnected, and the disconnect switch cannot be closed until all doors are closed.

c. Provide means to defeat the interlock.

d. Lockable in the off position.

ii. Control panels supplied with 120 VAC:

a. Provide an internal breaker with the line side

terminals covered by a barrier.

b. Provide a nameplate prominently positioned on the control panel identifying the location of the power source and a warning statement requiring the source to be disconnected before opening the door to the enclosure.

b) Selection and ratings of protective devices:

i. Interrupting ratings: Not less than the system maximum available fault current at the point of application.

ii. Voltage rating: Not less than the voltage of the application.

iii. Select current rating and trip characteristics to be suitable for:

a. Maximum normal operating current.

b. Inrush characteristics.

c. Coordination of the protective devices to each other and to the source breaker feeding the panel.

c) Provide a separate protective device for each powered electrical device:

i. An individual circuit breaker for each 120-VAC instrument installed within its respective control panel and clearly identified for function.

ii. An individual fuse for each PLC discrete output. Provide with individual blown fuse indication external of the I/O card:

iii. Size external fuse to open before any I/O-card-mounted fuses.

iv. An individual 5-ampere fuse for each discrete input loop.

v. An individual half (½) ampere fuse for each four (4) to 20 milliamperes analog loop powered from the control panel.

vi. Install protective devices on the back mounting panel and identify by a service nameplate in accordance with the wiring diagrams.

d) Fuses for four (4) to 20 milliamperes signals:

i. Provide durable, readily visible label for each fuse, clearly indicating the correct type, size, and ratings of replacement fuse:

a. Label shall not cover or interfere with equipment Manufacturer's instructions.

ii. Provide fuses rated for the voltage and available short-circuit current at which they are applied.

iii. Manufacturer: one (1) of the following or equal:

a. Bussmann.

e) Fuse holders:

i. Modular type:

a. DIN rail mounting on 35-millimeter rail.

b. Touch-safe design: All connection terminals to be protected against accidental touch.

c. Incorporates blown-fuse indicator.

ii. Provide nameplate identifying each fuse:

a. As specified in Section 260553.

iii. Manufacturer: one (1) of the following or equal:

a. Phoenix Contact.

b. Allen-Bradley 1492-FB Series B.

f) Control circuit breakers:

i. DIN rail mounting on 35-millimeter rail.

ii. Manual OPEN-CLOSE toggle switch.

iii. Rated for 250 VAC.

iv. Interrupting rating: 10 kiloampere (kA) or available fault current at the line terminal, whichever is higher.

v. Current ratings: As indicated on the Contract Drawings or as required for the application.

vi. Provide nameplate identifying each circuit breaker:

a. As specified in Section 260553.

vii. Manufacturer: one (1) of the following or equal:

a. Phoenix Contact.

b. ABB.

c. Allen-Bradley.

d. Square D.

4. Conductors and cables:

a) Power and control wiring:

i. Materials: Stranded, soft annealed copper.

ii. Insulation: 600 volts type MTW.

iii. Minimum sizes:

a. Primary power distribution: 12 AWG.

b. Secondary power distribution: 14 AWG.

c. Control: 16 AWG.

iv. Color:

a. AC power (line and load): Black.

b. AC power (neutral): White.

c. AC control: Red.

d. DC power and control (ungrounded): Blue.

e. DC power and control (grounded): White with Blue stripe.

f. Ground: Green.

b) Signal cables:

i. Materials: Stranded, soft annealed copper.

ii. Insulation: 600 volts, PVC outer jacket.

iii. Minimum size: 18 AWG paired triad.

iv. Overall aluminum shield (tape).

v. Copper drain wire.

vi. Color:

a. 2-Conductor:

- Positive (+): Black.
- Negative (-): White and red.

b. 3-Conductor:

- Positive (+): Black.
- Negative (-): Red.

- Signal: White.

vii. Insulate the foil shielding and exposed drain wire for each signal cable with heat-shrink tubing.

5. Conductor identification:
   a) Identify each conductor and cable with unique wire numbers as specified in Section 260553.
   b) Readily identified without twisting the conductor.
6. General wiring requirements:
   a) Wiring methods: Wiring methods and materials for panels shall be in accordance with the NEC requirements for General Purpose (no open wiring) unless otherwise specified.
   b) Install all components in accordance with the Manufacturer's instructions included in the listing and labeling.
   c) Provide a nameplate on the cover of the control panel identifying all sources of power supply and foreign voltages within the control panel.
   d) Provide transformers, protective devices, and power supplies required to convert the supply voltage to the needed utilization voltage.
   e) Provide power surge protection for all control panels.
   f) Provide signal surge protection within control panels for each analog I/O, discrete I/O, and data line (Copper Ethernet, Coax, Fieldbus signals) that originates from outdoor devices.
   g) Provide non-metallic ducts for routing and organization of conductors and cables:
      i. Provide wiring separation plan.
      ii. Size ducts for ultimate build-out of the panel, or for 20% spare, whichever is greater.
      iii. Provide separate ducts for signal and low-voltage wiring from power and 120-VAC control wiring:
   h) Cables shall be fastened with cable-mounting clamps or with cable ties supported by any of the following methods:
      i. Screw-on cable tie mounts.
      ii. Hammer-on cable-tie mounting clips.

iii. Fingers of the non-metallic duct.

i) Wire Ties:

i. No wire ties inside wire duct.

ii. Use Panduit Cable tie installation tool, with tension control/cutoff.

iii. Verify cut ends are cut flush filed smooth after installed.

j) Provide supports at the ends of cables to prevent mechanical stresses at the termination of conductors.

k) Support panel conductors where necessary to keep them in place.

l) Wiring to rear terminals on panel-mount instruments shall be run in non-metallic duct secured to horizontal brackets run adjacent to the instruments.

m) Conductors and cables shall be run from terminal to terminal without splice or joints. Exceptions:

i. Factory-applied connectors molded onto cables shall be permitted. Such connectors shall not be considered as splices or joints.

n) The control panel shall be the source of power for all 120-VAC devices interconnected with the control panel including, but not limited to:

i. Solenoid valves.

ii. Instruments both mounted in the control panel and remotely connected to the control panel.

2.3 EQUIPMENT (NOT USED)

2.4 COMPONENTS

1. Thermal management:

a) Provide heating, cooling, and dehumidifying devices in order to maintain all instrumentation and control devices to within a range as specified in Section 406100.

b) Enclosure temperature switch:

c) Provide wall-mounted bimetallic switch transmitter (to measure internal cabinet temperature in all enclosures) containing electrical components such as PLCs, RTUs, RIO, and VFDs.

i. Sensor and electronic enclosure.

ii. Accuracy: Within two (2) degrees Fahrenheit.

iii. Manufacturer: the following or equal:

a. Hoffman ATEMNC.

b. Pfannenberg FLZ.

c. Hammond Manufacturing.

2. Fan ventilation:

a) Provide Hoffman fan speed control:

i. Provide two (2) door/cabinet-mounted vent fans for every 72 inches of cabinet width.

ii. Provide finger-guard kit.

iii. Filter kit with two (2) spare filters for each intake fan.

b) Provide bezel and gasket kit.

3. Pilot devices:

a) General:

i. Provide operator pushbuttons, switches, and pilot lights, from a single Manufacturer.

ii. Size:

a. 30.5 millimeters.

iii. Heavy duty.

iv. Pushbuttons:

a. NEMA Type A600.

b. Furnish one (1) spare normally open contact and normally closed contact with each switch.

v. Selector switches:

a. NEMA Type A600.

b. Knob type.

c. Furnish one (1) spare normally open contact and normally closed contact with each switch.

d. Provisions for locking in the off position where lockout provisions are indicated on the Contract Drawings.

vi. Pilot lights:

a. Type:

- LED for interior installations.

b. Push to test.

c. Lamp color:

- On/Running/Start: Red.
- Off/Stop: Green.
- Power: White.
- Alarm: Amber.
- Status or normal condition: White.
- Opened: Amber.
- Closed: Blue.
- Failure: Red.

b) Indoor and outdoor areas:

i. NEMA Type 4X.

ii. Manufacturer: one (1) of the following or equal:

a. Allen-Bradley Type 800T.

b. Square D Class 9001, Type K.

c. General Electric Type CR104P.

d. IDEC TWTD Series.

c) Potentiometer and slidewire transmitters:

i. Provide a DC output in proportion to a potentiometer input.

ii. Potentiometer input:

a. 100 ohms to 100 K ohms.

b. Impedance Greater or equal to 1 M ohms.

c. Zero turn-up: 80% of full-scale input.

d. Span turn-down: 80% of full-scale input.

d) Field-configurable output:

i. Voltage and current: All conventional current loops and voltage control signals.

e) Accuracy including linearity and hysteresis within 0.1% maximum at 25 degrees Celsius.

f) Operating temperature: 0 to 55 degrees Celsius.

g) Supply power: 9 to 30 VDC.

h) Manufacturer: the following or equal:

i. Phoenix Contact.

4. Relays:

a) General:

i. For all types of 120-VAC relays, provide surge protection across the coil of each relay.

ii. For all types of 24-VDC relays, provide a free-wheeling diode across the coil of each relay.

b) General purpose:

i. Magnetic control relays.

ii. NEMA Type A300 rated:

a. 300 volts.

b. 8 Amps continuous (minimum).

c. 7,200 volt-amperes make.

d. 720 volt-amperes break.

c) Plug-in type.

d) LED indication for energization status.

e) Coil voltages: As required for the application.

f) Minimum poles: DPDT.

g) Touch-safe design: All connection terminals to be protected against accidental touch.

h) Enclose each relay in a clear plastic heat and shock-resistant dust cover.

i) Quantity and type of contact shall be as indicated on the Contract Drawings or as needed for system compatibility.

j) Relays with screw-type socket terminals.

k) Provide additional (slave/interposing) relays when the following occurs:

i. The number or type of contacts shown exceeds the contact capacity of the specified relays.

ii. Higher contact rating is required in order to interface with starter circuits or other equipment.

l) DIN rail mounting on 35-millimeter rail.

m) Ice-cube-type relays with retainer clips to secure relay in socket.

n) Integrated label holder for device labeling.

o) Manufacturer: one (1) of the following or equal:

i. Phoenix Contact PLC Series.

ii. Potter and Brumfield Type KRP or KUP.

iii. IDEC R* Series (* = H, J, R, S, U).

iv. Allen-Bradley Type 700 HC.

v. Square D Type K.

5. Latching:

a) Magnetic-latching control relays.

b) NEMA Type B300 rated:

i. 300 volts.

ii. 10 Amps continuous.

iii. 3,600 volt-amperes make.

iv. 320 volt-amperes break.

c) Plug-in type.

d) DIN rail mounting on 35-millimeter rail.

e) Coil voltage: As required for the application.

f) Minimum poles: two (2) PDT; as required for the application. Plus one (1) spare pole.

g) Touch-safe design: All connection terminals to be protected against

h) accidental touch.

i) Clear cover for visual inspection.

j) Provide retainer clip to secure relay in socket.

k) Manufacturer: one (1) of the following or equal:

i. Square D 8501, Type K.

ii. IDEC TWTD Series.

6. Time delay:

a) Provide time-delay relays to control contact transition time.

b) Contact rating:

i. 240 volts.

ii. 10 Amps continuous.

iii. 3,600 volt-amperes make.

iv. 360 volt-amperes break.

c) Coil voltage: As required for the application.

d) Provide pneumatic or electronic type with on-delay, off-delay, and on/off- delay:

i. For off-delay, use true power-off time-delay relays. Where the required timing range exceeds capability of the off-delay relay use, signal off-delay where power loss will not cause undesirable operation or pneumatic time-delay relays.

ii. Minimum poles: two (2) PDT.

iii. Units include adjustable dial with graduated scale covering the time range in each case.

iv. Minimum timing range: 0.1 seconds to 10 minutes, or as required for the application.

v. Manufacturer: one (1) of the following or equal:

a. IDEC RTE Series.

b. Agastat Series 7000 (pneumatic).

c. Allen-Bradley Type 700-HR.

7. Terminal blocks:

a) DIN rail mounting on 35-millimeter rail.

b) Suitable for specified AWG wire.

c) Rated for 15 amperes at 600 volts.

d) Screw terminal type.

e) Provide mechanism to prevent wire connection from loosening in

environments where vibration is present. This mechanism shall not cause permanent deformation to the metal body.

f) Finger-safe protection for all terminals for conductors.

g) Construction: Polyamide insulation material capable of withstanding temperature extremes from - 40 to 105 degrees Celsius.

h) Terminals: Plainly identified to correspond with markings on the diagrams:

   i. Permanent machine-printed terminal identification.

i) Disconnect-type field signal conductor terminals with socket/screw for testing.

j) Identify terminals suitable for use with more than one (1) conductor. Position:

   i. So that the internal and external wiring does not cross.

   ii. To provide unobstructed access to the terminals and their conductors.

k) Provide minimum 25% spare terminals.

   i. Manufacturer: one (1) of the following or equal:

      a. Phoenix Contact UK5 Series.

      b. Allen-Bradley 1492 Series.

   ii. Wire duct:

      a. Provide flame retardant plastic wiring duct, slotted with dust cover.

      b. Type:

         - Wide slot.
         - Narrow slot.
         - Round hole.

      c. Manufacturer: the following or equal:

         - Panduit.

8. DIN Rail:

   a) Perforated Steel.

   b) 35mm width.

c) 15mm deep.

d) Provide 2 inch offset using one (1) of the following:

i. Offset brackets.

ii. Preformed standoff DIN Rail Channel.

9. Surge protection devices:

a) Control panel power:

i. 120-volt control power source: Non-UPS powered:

ii. Provide surge protection device (SPD) for panel power entrances:

a. Nominal 120-VAC with a nominal clamping voltage of 200 volts.

b. Non-faulting and non-interrupting design.

c. A response time of not more than five (5) nanoseconds.

b) Control panel power system level protection, non-UPS powered:

i. Designed to withstand a maximum 10-kA test current of a 8/20 µs waveform according to IEEE C62.41.1 Category C Area.

ii. For panels receiving power at 120 VAC, provide surge protection at secondary of main circuit breaker.

iii. Provide both normal mode noise protection (line to neutral) and common mode (neutral to ground) surge protection.

iv. DIN rail mounting.

v. Attach wiring to the SPD by means of a screw-type cable-clamping terminal block:

a. Gas-tight connections.

b. The terminal block: Fabricated of non-ferrous, non-corrosive materials.

vi. Visual status indication of MOV status on the input and output circuits.

vii. Dry contact rated for at least 250 VAC, 1 Amp for remote status indication.

viii. Meeting the following requirements:

a. Response time: Less than or equal to 100 nanoseconds.

b. Attenuation: Greater than or equal to -40 dB at 100 kilovolt-Hertz as determined by a standard 50-ohm insertion test.

c. Safety approvals:

- UL 1283 (EMI/RFI Filter).
- UL 1449 2nd Edition.

d. Manufacturer: one (1) of the following or equal:

- Phoenix Contact Type SFP TVSS/Filter.
- Liebert Accuvar Series.
- Islatrol.

c) Instrument, data, and signal line protectors (traditional I/O) – panel mounted:

i. Surge protection minimum requirements: Withstand a 10-kA test current of 8/20 µs waveform in accordance with IEEE C62.41.1 Category C Area.

ii. DIN rail mounting on 35-millimeter rail (except field-mounted SPDs).

iii. SPDs consisting of two (2) parts:

a. A base terminal block.

b. A plug protection module:

- Replacing a plug shall not require the removal of any wires nor interrupt the signal.
- Base and plug coded to accept only the correct voltage plug.

iv. SPD Manufacturer: one (1) of the following or equal:

a. Phoenix Contact Plugtrab Series.

b. Bournes Series 1800.

d) Instrument, data, and signal line protectors (traditional I/O) – field mounted:

i. Surge protection minimum requirements: Withstand a minimum 10-kA test current of a 8/20 µs waveform in

accordance with IEEE C62.41.1 Category C Area.

ii. Manufacturer: one (1) of the following or equal:

a. Plugtrab PT Series.

b. MTL TP48 Series.

10. Variable frequency drives:

a) As specified in Section 262923.

11. Limit switches:

a) NEMA.

b) AC contact rating 120 volts, 10 A.

c) DC contact rating 125 volts, 0.4 A.

d) Provide robust actuation mechanism not prone to degradation.

e) Provide complete actuator mechanism with all required hardware.

f) Allows for contact opening even during contact weld condition.

g) UL approved.

h) Operating temperature range: -18 to +110 degrees Celsius.

i) Manufacturer: one (1) of the following or equal:

i. Allen-Bradley 802 Series.

ii. Honeywell HDLS Series.

iii. Omron D4 Series.

iv. Eaton E47, E49, E50.

v. ABB.

2.5 ACCESSORIES

1. As specified in Section 406100.
2. Provide panels with an inside protective pocket to hold the Panel Drawings. Ship panels with one (1) copy of accepted Shop Drawings including, but not limited to, schematic diagram, connection diagram, and layout drawing of control wiring and components in a sealed plastic bag stored in the panel drawing pocket.
3. Provide 15 inch floor stands or legs where needed or as indicated on the Contract Drawings.
4. Provide nameplate to each panel as indicated on the Contract Drawings:

a) Provide as specified in Section 260553 on all internal and external instruments and devices.

b) Provide a nameplate with the following markings that is plainly visible after installation:

i. Manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the panel can be identified.

ii. Supply voltage, phase, frequency, and full-load current.

iii. Power source or circuit ID.

iv. Short-circuit current rating of the panel based on one (1) of the following:

a. Short-circuit current rating of a listed and labeled assembly.

b. Short-circuit current rating established utilizing an approved method.

c) Provide enclosures with a flange-mounted disconnect that is interlocked with the doors.

5. Lighting:

a) Provide one (1) luminaire for each section, on the interior of the panel, spaced evenly along the top-front of the enclosure door opening(s):

i. Covered or guarded.

ii. Provide On-Off door-activated switches where indicated on the Contract Drawings.

iii. 120-volt, single-phase, 15-amp style plug.

iv. Provide 4,000 K, 900 Lumens – LED fixture.

a. Provide additional fixtures for every 36 inches of width.

6. Grounding:

a) Provide the following:

i. Grounding strap between enclosure doors and the enclosure.

ii. Equipment grounding conductor terminals.

iii. Provide equipment ground bus with lugs for connection of

all equipment grounding wires.

iv. Bond multi-section panels together with an equipment grounding conductor or an equivalent grounding bus.

b) Identify equipment grounding conductor terminals with the word “GROUND,” the letters “GND,” the letter “G,” or the color green.

c) Ensure the continuity of the equipment grounding system by effective connections through conductors or structural members.

d) Provide an equipment-grounding terminal for each incoming power circuit, near the phase conductor terminal.

e) Size ground wires in accordance with NEC and UL Standards, unless noted otherwise.

f) Connect all exposed, noncurrent-carrying conductive parts, devices, and equipment to the equipment-grounding circuit.

g) Connect the door stud on the enclosures to an equipment-grounding terminal within the enclosure using an equipment-bonding jumper.

2.6 MIXES (NOT USED)

2.7 FABRICATION (NOT USED)

2.8 FINISHES

1. Finishes:

a) All cabinet enclosure must be NEMA Type 4X stainless steel.

2.9 SOURCE QUALITY CONTROL

1. As specified in Section 406100.

3.0 EXECUTION

3.1 EXAMINATION

1. Examine the installation location for the instrument and verify that the instrument will Work properly when installed.

a) Notify the Engineer promptly if any installation condition does not meet the instrument Manufacturer’s recommendations or specifications.

3.2 PREPARATION (NOT USED)

3.3 INSTALLATION

1. Install enclosures so that their surfaces are plumb and level within 1/8 inch

over the entire surface of the panel; anchor securely to wall and structural supports at each corner, minimum.

2. Install the enclosure per guidelines and submitted installation instructions to meet the seismic requirements at the Site.
3. Provide floor stand kits for wall-mounted enclosures larger than 48 inches high.
4. Provide 3 ½ inch-high concrete housekeeping pads for freestanding enclosures.
5. Install gasket and sealing material under panels with floor slab cutouts for conduit:
6. Undercoat floor-mounted panels.
7. Provide a full-size equipment-grounding conductor in accordance with NEC included with the power feeder. Terminate to the incoming power circuit-grounding terminal.
8. All holes for field conduits, etc. shall be cut in the field. There shall be no additional holes, factory cut holes, or hole closers allowed. Incorrect holes, additional holes, or mis-cut holes shall require that the entire enclosure be replaced.
9. Side Panels:
    a) Side panels shall be kept free off all control equipment and devices. Any deviation will be sent to the engineer in writing asking for a deviation.

3.4 ERECTION, INSTALLATION, APPLICATION, AND CONSTRUCTION (NOT USED)

3.5 REPAIRS/RESTORATION (NOT USED)

3.6 RE-INSTALLATION (NOT USED)

3.7 FIELD QUALITY CONTROL

1. As specified in Section 406100.

3.8 ADJUSTING (NOT USED)

3.9 CLEANING

1. As specified in Section 406100.

3.10 DEMONSTRATION AND TRAINING

1. The Contractor shall demonstrate in the presence of the Engineer at the Integrator's place of business in the presence of the Regional District an error free simulation of the Contractor panels. The control panels will not

ship until the Regional District has confirmed in writing the authorization to ship to the site.

3.11 PROTECTION

1. As specified in Section 406100.

3.12 SCHEDULES (NOT USED)

END OF SECTION

Section 400567 Electronic-Control Valve and Valve Controller

1.0 GENERAL

1.1 INTRODUCTION

This specification covers the design, manufacture, and testing of 8 inch (200 mm) Control Valve and the required valve controller.

2.0 PRODUCTS

2.1 Standard products - use the same Manufacturer for multiple units of same type.

2.2 "Tying" of equipment into packages for the purpose of thwarting competition shall be considered to be in non-compliance with these specifications.

2.3 Manufacturers shall price items under different subsections or sections separately.

3.0 ELECTRONIC FLOW CONTROL VALVE

3.1 FUNCTION

1. The Electronic Flow Control Valve shall be capable of controlling downstream pressure, rate of flow, upstream pressure sustaining, tank level control (altitude and modulating), valve position, blending, pressure management or select combinations of any of these applications. Solenoid pilot controls equipped onto the control valve are actuated by electrical signals received from a valve controller. The solenoid pilots either add or relieve line pressure from the cover chamber of the control valve, causing it to open or close, ensuring the process variable signal follows the set-point command signal. This enables remote control over the electronic control valve operations.
2. The process variable signal would come from a flow meter, pressure sensor or other monitoring instrumentation. Upon receiving the remote setpoint command from the valve controller, the valve controller shall command the valve to modulate and maintain the desired setpoint value. When the feedback signal deviates from the setpoint, the appropriate opening or closing solenoid on the valve will pulse. As the feedback signal approaches the setpoint, this on/off pulse time will gradually decrease to smoothly modulate the valve to setpoint. When the feedback signal is within a programmable dead band, the opening and closing solenoids will lock the cover and the electronic valve will maintain position.
3. The Control Valve shall be equipped with inlet and outlet valve-mounted pressure transmitters, and a valve-mounted position transmitter.
4. The Control valve will have a CS3 electronic interface and have the check valve with cock option.

5. The electronic valve controller shall be able to calculate the flow rate through the control valve using an algorithm and the readings received from the pressure and position transmitters.
6. The valve controller shall provide 4-20mA analog outputs giving the ability to retransmit the calculated flow, measured inlet pressure, measured outlet pressure, and measured valve position. The valve controller shall also have the ability to log all data to a local Secure Digital (SD) card which can be exported in CSV file format for analysis.
7. The valve controller will come equipped with a 4.3 inch Color TFT-LCD to graphically display valve and application information locally. An easy to use five (5) press-button operator interface keypad provides simple navigation through software menus.
8. Two (2) pipe support stands shall support the control Valve, one (1) of each side of the valve. If the stands are not stainless steel, they are to be painted Blue by TNEMEC.

3.2 MATERIALS

1. Material Specification for the Pressure Reducing Control Valves Main Valve as follows:

Component	Material
Body & Cover	Ductile Iron-ASTM A536
Main Valve Trim	Bronze, Stainless Steel
Seat	Bronze, Stainless Steel
Stem, Nut and Spring	Stainless Steel
Seal Disc	Buna-N® Rubber
Diaphragm	Nylon Reinforced Buna-N® Rubber
Internal Trim Parts	Stainless Steel: Bronze; Brass
End Detail	Flanged (8 inch)
Pressure Rating	Class 150 lb. (250psi Max.)
Temperature Range	Water to 180^{o}F
Any other wetted metallic parts	Stainless Steel;
Coating	Fusion Bonded Epoxy Coating (Interior and Exterior); ANSI / NSF 61 Approved, AWWA coating specifications C116-03.

3.3 MANUFACTURE

1. Main Valve:
    a) The main valve shall be hydraulically operated, single diaphragm actuated, globe or angle pattern. The valve shall consist of three (3) major components; the body with seat installed, the cover with bearing installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from line pressure. Packing glands, stuffing boxes and/or rolling diaphragm technology will not be permitted and there shall be no pistons operating the main valve or pilot controls. No fabrication or welding shall be used in the manufacturing process. Y-pattern valves shall not be permitted. The main valve shall be certified by NSF/ANSI Standard 61 as a safe drinking water system component.
2. End Connections:
    a) End Connections for control valve shall be flanged per ASME/ANSI B16.42, Class 150 (8 inch).
3. Main Valve Body:
    a) No separate chamber(s) below the diaphragm shall be allowed between the main valve cover and body. No fabrication or welding shall be used in the manufacturing process.
    b) The valve shall contain a resilient, synthetic rubber disc with a rectangular cross-section contained on three (3) and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the discs firmly in place. The disc retainer shall be of a sturdy one (1) piece design capable of withstanding opening and closing shocks. It will have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hour-glass shaped disc retainers shall be permitted and no V-type or slotted-type disc guides shall be used.

c) The diaphragm assembly containing a non-magnetic stainless-steel stem; of sufficient diameter to withstand high hydraulic pressures and shall be fully guided at both ends by a bearing in the main valve cover and an integral bearing in the valve seat. The valve seat shall be a solid, one (1) piece design and shall have a minimum five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from the line pressure. No bolts or cap screws shall be permitted for use in the construction of the diaphragm assembly.

d) The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm's center hole for the main valve stem will be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm will withstand a Mullins Burst Test of a minimum of 600 X per layer of nylon fabric and shall be cycled tested 100,000 times to ensure longevity. The diaphragm should not be used as the seating surface. The diaphragm shall be fully supported in the valve body and covered by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully opened or fully closed position. Bellofram type rolling diaphragms shall not be permitted.

e) The main valve seat and stem bearing in the valve cover shall be removable. The valve seat in the 8 inch and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To ensure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No “pinned” covers to the valve body shall be permitted. Cover bearing, disc retainer and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. The valve shall be designed such that both the cover assembly and internal diaphragm assembly can be disassembled and lifted vertically straight up from the top of a narrow opening/vault. Y-pattern valves shall not be permitted. The seat shall be a solid one (1) piece design. Two (2)piece seats or seat inserts shall not be permitted. Packing glands and/or stuffing boxes shall not be permitted.

4. Pilot Control System:

    a) The pilot control shall be through two (2) direct acting two-way solenoid pilot valves controlled by an external power source. The pilot control system shall include strainers and solenoid manual bypass valves. The pilot control system will utilize stainless steel control tubing with stainless steel fittings. The solenoid pilot valves either add or relieve line pressure from the cover chamber of the main valve, causing it to open or close as directed by the electronic controller. Solenoids shall have NEMA 4X enclosures.

5. Material Specification for Solenoid Pilot Controls:

Component	Material
Body	Brass B283 (standard)
Pilot Trim	Brass & 303 Stainless Steel
Seals and Disc	NBR
Core and Plugnut	430F Stainless Steel
Core Springs	302 Stainless Steel
Shading Coil	Copper
Disc-Holder	CA
Core Guide	CA
Connections	FNPT
Pressure rating	400 psi Max.
Temperature Range	AC: Water to 125°F Max.
	DC: Water to 104°F Max.
Power Supply	120VAC / 60 Hz (standard)
Enclosure	NEMA Type 1, General Purpose., Watertight (standard)
Control Tubing	Stainless Steel
Control Fittings	Stainless Steel

6. Factory Assembly:
    a) Each control valve shall be factory assembled
        i. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008.
        ii. For all control valves, the factory assembly shall include the complete main valve, pilot valve(s), and all associated accessories and control equipment.
        iii. During factory assembly the control valve manufacture shall make all necessary adjustments and correct any defects.
    b) Nameplates:
        i. Each Control Valve and associated pilot(s) shall be provided with an identifying nameplate.
            a. Nameplates, depending on type and size of control

valve, shall be mounted in the most practical position possible, typically on the inlet side of the valve body.

b. Nameplates shall be brass and a minimum of 3/32 inch thick, ¾ inch high and 2 3/4 inch long

c. Pertinent control valve data shall be etched or stamped into the nameplate. Data shall include control valve Catalog number, function, size, material, pressure rating, end-connection details, type of pilot controls used and control adjustment range.

c) Factory Testing:

i. Each control valve shall be factory tested.

ii. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008.

iii. Tests shall conform to approved test procedures.

iv. The standard factory tests shall include a valve body and cover leakage test, seat leakage test and a stroke test. Control valves and pilot valves, in the partially open position, with both ends closed off with blind flanges (valves) and pipe plugs (pilots), shall be subject to an air test. The applied air pressure shall be 90 psi minimum. All air pressure tests shall be applied for a minimum of 15 minutes. No visible leakage is permitted through the valve seat, the pressure boundary walls of the valve body, valve cover, pilot body, pilot cover or the body-cover joint.

v. Control valve Manufacturer shall, upon request, offer additional testing, such as high-pressure hydrostatic testing, positive material inspection testing, ferrite testing, liquid penetration inspection testing, magnetic particle examination testing and radiographic examination testing.

7. PRODUCT DATA

a) The following information shall be provided:

i. Control Valve Manufacturer's technical product data.

ii. Control Valve Manufacturer's Installation, Operation and Maintenance manual (IOM).

b) Provide specific information on all optional features specified

above and confirm that these items are provided.

c) The valve Manufacturer shall be able to supply a complete line of equipment from 1 inch through 36 inch sizes and a complete selection of complementary accessories and equipment.

d) The control valve Manufacturer shall provide a computerized cavitation analysis report which shows flow rate, differential pressure, and percentage of valve opening. CV factor, system velocity, and if there will be cavitation damage.

e) The Manufacturer will also provide valve noise levels according to International Standards over the flow range of the valve. Noise calculation program will be specific to the control valve Manufacturer, and based upon tests conducted by a third-party, independent laboratory and will be able to provide dBA values for octave band frequencies between 31.5 and 8000 Hz. (Valves with KO trim calculations are per another industry accepted standard without the octave band frequency noise levels). Generic, third-party noise calculation for non-specific control valves will not be accepted.

4.0 EXECUTION

4.1 DELIVERY, STORAGE AND HANDLING

1. Delivery
    a) The Manufacture shall deliver the control valves to the Contractor to be delivered to the Work site for installation.
    b) Upon delivery, control valves are to be unloaded and stored by the Contractor until installation of the product.
2. Packing and Shipping
    a) Control valves specified herein shall be factory assembled. Any control valve appurtenances, accessories, parts and assemblies that are shipped unassembled shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field.
    b) Care shall be taken in loading, transporting and unloading to protect control valves, appurtenances, or coatings from damage. Equipment shall not be dropped. All control valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Any damage(s) shall be repaired.
    c) Prior to shipping, the control valves and all associated accessories should be acceptably packaged and covered to prevent entry of foreign material.
    d) All packaged control valves shall be shipped, remain covered and stored on site until they are installed and put into use.

e) The Contractor will provide and complete all the necessary electrical connections to the valve controller and ensure the full operation including the opening and closing of the solenoids on the flow control valve and the valve controller is achieved from the point of connection to the Regional District's SCADA point of connection, located in the Well head controller room. This includes the Contractor installing a new 50 mm Schedule 80 solvent welded electrical conduit, including all sweeps and providing the excavation, and manhole penetrations for the new conduit and wiring inside the conduit from the point of connection in the well control room to the flow control valve and the valve controller landing points located in the manhole structure. Contractor to also complete the manhole penetrations for the electrical conduit and power cable routing.

f) The valve controller will be mounted on the panel inside the well-head control room at the point of connection to the Regional Districts' SCADA point of connection. The source of power for the valve controller will be from the Regional District's SCADA 4-20 ma output/input SCADA point of connection terminal.

4.2 FIELD TESTING

1. A direct factory representative shall be made available by the equipment supplier for start-up service, inspection and necessary adjustments for a complete and operational system free of malfunction.
2. The flow control valve and valve controller Manufacturer shall warrant the valve and the controller to be free of defects in material and workmanship for a period of three (3) years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one (1) year warranty.
3. The Flow control valve (supplied with VC-22D valve controller) shall be CLA-VAL Company Model No. 133-AV.

END OF SECTION

Section 400578 Air /Vacuum Valves for Water Service

1.0 GENERAL

1.1 This specification is intended to cover the design, manufacture, and testing of ½ inch (13 mm) through 6 inch (150 mm).

1. Air Release Valves suitable for clean or raw water service with pressures up to 740 psi (5100 kPa).

1.2 Air Release Valves shall be automatic float operated valves designed to release accumulated air from a piping system while the system is in operation and under pressure. The capacity and pressure rating of the valve is dependent on the diameter of the precision orifice in the cover. A large inlet connection is required for proper air and water exchange.

2.0 PRODUCTS

2.1 Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.

2.2 Valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components – Health Effects.

2.3 The Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

2.4 Models 15A and 22 shall be Factory Mutual Approved and Underwriters Laboratories Listed for fire protection.

2.5 The cover shall be bolted to the valve body and sealed with a flat gasket. Resilient seats shall be replaceable and provide drop tight shut off to the full valve pressure rating.

2.6 Floats shall be unconditionally guaranteed against failure including pressure surges. Mechanical linkage shall provide sufficient mechanical advantage so that the valve will open under full operating pressure. Simple lever designs shall consist of a single pivot arm and a resilient orifice button. Compound lever designs shall consist of two (2) levers and an adjustable threaded resilient orifice button.

2.7 The valve body and cover shall be constructed of ASTM A126 Class B cast iron for working pressures up to 300 psi. Higher pressure rated valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron.

2.8 The orifice, float and linkage mechanism shall be constructed of Type 316 stainless steel. Non-metallic floats or linkage mechanisms are not acceptable. The orifice button shall be Viton or equivalent for simple lever valves and Buna-N or equivalent for compound lever designs.

2.9 The valve shall have a vacuum check on the outlet to prevent air from re-entering the system during negative pressure conditions.

2.10 A screened hood on the outlet shall be provided.

2.11 A fully ported brass ball valve shall be provided when specified to isolate the air release valve from the piping system.

2.12 Valve interiors and exteriors shall be coated with an NSF/ANSI 61 certified fusion bonded epoxy in accordance with AWWA C550.

2.13 The air (release, vacuum, etc.) valve installed in the manhole shall include an inflow preventer to prevent the introduction of contaminated water through the air valve outlet. The inflow preventer shall allow the admittance and exhaustion of air while preventing contaminated water from entering during normal operating conditions. The inflow preventer shall be flow tested by an independent third-party to certify performance. The third-party shall be an approved testing lab of the American Society of Sanitary Engineers.

2.14 The Manufacturer shall demonstrate a minimum of five (5) years' experience in the manufacture of air valves. The Manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

2.15 The exterior of the valve shall be coated with a universal alkyd primer.

2.16 The Air Release/Vacuum Valve shall Model No. 102 S as manufactured by Val-Matic Valve and Manufacturing Corporation, Elmhurst, Il, USA or approved equal.

3.0 EXECUTION

3.1 Valves 3 inch (76mm) and smaller shall be threaded with NPT inlets and outlets. The body inlet connection shall be hexagonal for a wrench connection. Larger valves shall have ANSI Class 125 flanged inlets.

3.2 The valve shall have two (2) additional NPT connections for the addition of gauges, testing, and draining.

END OF SECTION

Division 46 Water Equipment

Section 460594 Mechanical Equipment Testing

1.0 GENERAL

1.1 SUMMARY

1. Section includes: Testing of mechanical equipment and systems.

1.2 REFERENCES

1. American Water Works Association (AWWA):
    a) C654 - Disinfection of Wells.
2. National Electrical Manufacturers Association (NEMA).
3. NSF International (NSF):
    a) Standard 61 Annex G - Drinking Water System Components - Health Effects.
4. International Standards Organization (ISO):
    a) 9001-2000 - Quality Management Systems --Requirements.
5. American National Standards Institute (ANSI):
    a) S1.4 Specification for Sound Level Meters.
6. Hydraulic Institute (HI).
    a) National Institute of Standards and Technology (NIST).

1.3 SUBMITTALS

1. Schedule of source (factory) tests, Regional District training, installation testing, functional testing, clean water facility testing, closeout documentation, process start-up and process operational period as specified in this Section and equipment sections.
2. Test reports as specified in this Section and equipment sections.

1.4 SOURCE QUALITY CONTROL

1. Witnessing: Source or factory testing shall be witnessed by the Engineer or Regional District when scheduled; provide advanced notice of source testing as specified in Section 460594.
2. Equipment performance test: Test level as scheduled; test as specified in Section 460594.
3. Driver test: Test driver as part of pump test.
4. Temperature, noise, and vibration testing specified within the general equipment performance and pump performance test sections is not

required for wet pit installations.

2.0 PRODUCTS

2.1 As specified within the Contract Documents

3.0 EXECUTION

3.1 PUMP INSTALLATION AND WELL CLEANING AND MAINTENANCE

1. Refer to Section 332113 Well Rehabilitation.

3.2 WELL CLEANING AND TESTING PROCEDURAL SPECIFICATIONS

1. Refer to Section 332113 Well Rehabilitation

3.3 TEMPORARY TEST PUMP REMOVAL AND PERMANENT PUMP INSTALLATION

1. Refer to Section 332113 Well Rehabilitation

3.4 WELL DISINFECTION PROCEDURAL SPECIFICATIONS

1. Refer to Section 332113 Well Rehabilitation

3.5 ANALYSIS REQUIREMENTS

1. Refer to Section 332113 Well Rehabilitation

3.6 MATERIAL SPECIFICATIONS

1. Refer to Section 332113 Well Rehabilitation

3.7 FIELD QUALITY CONTROL

1. Refer to Section 332113 Well Rehabilitation.

3.8 Regional District's FIELD SERVICE

1. Refer to Section 332113 Well Rehabilitation.

4.0 TESTING AND REPORTING STANDARDS

4.1 GENERAL

1. Commissioning and process start-up of equipment as specified in:
    a) This section.
    b) Equipment sections.
        i. If testing requirements are not specified, provide Level 1 Tests.
2. Prepare and submit test reports as specified.
3. Testing levels:
    a) Level 1 Tests:
        i. Level 1 General Equipment Performance Test:

a. Confirm that equipment is properly assembled, equipment moves or rotates in the proper direction, shafting, drive elements and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.

ii. Level 1 Pump Performance Test:

a. Measure flow and head while operating at or near the rated condition; for factory testing, testing may be at reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.

b. Record measured flow, suction pressure, discharge pressure, and make observations on bearing temperatures and noise levels.

iii. Level 1 Vibration Test:

a. Test requirement:

- Measure filtered vibration spectra versus frequency in three (3) perpendicular planes at each normally accessible bearing housing on the driven equipment, any gears and on the driver; one (1) plane of measurement to be parallel to the axis of rotation of the component.
- Vibration spectra versus frequency shall be in accordance with Vibration Acceptance Criteria.

b. Equipment operating condition: Test at specified maximum speed.

iv. Level 1 Noise Test:

a. Measure unfiltered overall A-weighted sound pressure level in dBA at 3 feet horizontally from the surface of the equipment and at a mid- point of the equipment height.

b) Level 2 Tests:
    i. Level 2 General Performance Test:
        a. For equipment, operate, rotate, or otherwise functionally test for at least two (2) hours after components reach normal operating temperatures.
        b. Operate at rated design load conditions.
        c. Confirm that equipment is properly assembled, equipment moves or rotates in the proper direction, shafting, drive elements and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.
    ii. Level 2 Pump Performance Test:
        a. Test two (2) hours minimum for flow and head at the rated condition; for factory testing, testing may be at a reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.
        b. Test for flow and head at two (2) additional conditions; one (1) at 25% below the rated flow and one (1) at 10% above the rated flow.
        c. Record measured flow, suction pressure, discharge pressure, and observations on bearing temperatures and noise levels at each condition.

c) Level 2 Vibration Test:
    i. Test requirement:
        a. Measure filtered vibration spectra versus frequency and measure vibration phase in three (3) perpendicular planes at each normally accessible bearing housing on the driven equipment, any gears and on the driver; one (1) plane of measurement to be parallel to the axis of rotation of the component; measure actual rotational speeds for each vibration spectra measured using photometric or other tachometer input connected directly to the vibration data collector.
        b. Vibration spectra versus frequency shall be in accordance with Vibration Acceptance Criteria.

ii. Equipment operating condition: Repeat test requirements at design specified maximum speed and at minimum speed for variable speed equipment.

iii. Natural frequency test of field installed equipment:

a. Excite the installed equipment and support system in three (3) perpendicular planes, use same planes as operating vibration measurement planes, and determine the as-installed natural resonant frequency of the driven equipment, the driver, gears and supports.

b. Perform test at each bearing housing, at each support pedestal, and for pumps on the suction and discharge piping.

c. Perform with equipment and attached piping full of intended service or process fluid.

iv. Level 2 Noise Test:

a. Measure filtered A-weighted overall sound pressure level in dBA for each of eight (8) octave band mid-points beginning at 63 hertz measured at 3 feet horizontally from the surface of the equipment at mid-point height of the noise source.

4.2 Variable speed equipment tests:

1. Establish performance over the entire speed range and at the average operating condition.
2. Establish performance curves for the following speeds:

i. The speed corresponding to the rated maximum capacity.

ii. The speed corresponding to the minimum capacity.

iii. The speed corresponding to the average operating conditions.

4.3 COMMISSIONING PHASE

1. Source testing
2. Witnessing not required unless specified otherwise in equipment section.
3. Witnessed tests: Schedule test date and notify Engineer at least five (5) days prior to start of test.

END OF SECTION