

SUPPLEMENTARY SPECIFICATIONS

Division 01 – General Requirements

Section 01 10 00 General Requirements

PART 1 GENERAL

1.1 Documents

- .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.
- .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.

1.2 Coordination and Cooperation

- .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 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.
- .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.

1.3 Daily Record

- .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 Consultant's and the Owner's inspections at all reasonable times. A copy of the record shall be turned over to the Consultant at weekly intervals.
- .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.

1.4 Permits and Fees

- .1 No building permit is required.
- .2 Archaeological and Environmental Management Act permits will be obtained by the Owner.
- .3 The Contractor shall obtain all other permits and licenses required for the Work. It is anticipated that only electrical permit and any road use permits will be required for this contract.
- .4 The Contractor shall conform to the codes, ordinances, regulations, and orders of all authorities having jurisdiction over the performance of the Work. Should conflicts arise, the Contractor shall forthwith request clarification from the Owner.

1.5 Work Area

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

- .2 Streets beyond the limits of the work and other construction areas shall be kept clean.
- .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 Owner.
- .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.
- .5 Prior to commencement of construction, the Owner and the Contractor will locate on site those property bars, baselines and benchmarks which are necessary to delineate the Working Area and to lay out the Work, all as shown on the Contract Drawings.
- .6 The Contractor shall be responsible for the preservation of all property corners while the Work is in progress, except those property bars which must be removed to facilitate the Work. Any property bars disturbed, damaged, or removed by the Contractor's operations shall be replaced under the supervision of a British Columbia Land Surveyor, at no extra cost to the Owner.
- .7 The Contractor will give the Owner 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 must 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 Owner for or on account of any alleged inaccuracies, unless the Contractor notified the Owner of such inaccuracies in writing before commencing the work.
- .8 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 Owner 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.
- .9 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 Owner. 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.
- .10 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 Owner.
- .11 The Contractor shall furnish the Owner 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.
- .12 In order to satisfy the Owner 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 Owner at the Contract pre- construction meeting.

- .13 Dusty materials shall be transported in covered haulage vehicles. Wet materials shall be transported in suitable watertight haulage vehicles.
- .14 The Contractor shall take such steps as may be required to prevent dust nuisance resulting from its operations either within the limits of the work or elsewhere or by public traffic where it is the Contractor's responsibility to maintain a roadway through the Work.
- .15 Where the Work requires the sawing of asphalt or the sawing or grinding of concrete, blades and grinders of the wet type shall be used together with sufficient water to prevent the incidence of dust, wherever dust would affect traffic or wherever dust would be a nuisance to residents of the area where the Work is being carried out.
- .16 Permitted dust control measures may include the application of calcium chloride, or water. More frequent applications of water should be employed in close proximity to watercourses.

1.6 Construction Schedule

- .1 To co-ordinate the work, the Contractor or person(s) authorized to act for the Contractor will attend regular meetings with the Owner 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 Owner.
- .2 The Contractor shall commence the Work within five (5) days after receiving Notice to Proceed from the Owner.

1.7 Preconstruction Meeting

- .1 The Contractor shall attend a meeting with the Consultants, Subcontractors, field inspectors, supervisors, and the Owner to discuss and resolve administrative procedures and responsibilities, and scheduling prior to commencing the Work.
- .2 Items to be discussed at such meeting shall include, but shall not necessarily be limited to the following:
 - .1 Confirmation of authorized representatives of the Owner, Consultant, other consultants and the Contractor and the name of the Contractor's Construction Safety Officer.
 - .2 Schedule of Work.
 - .3 Site security.
 - .4 Takeover procedures, and acceptance.
 - .5 Monthly progress payment requests, administrative procedures, and holdbacks.

1.8 Progress Meetings

- .1 The Contractor shall hold progress meetings every week at the Owner's office throughout the duration of the Work.
- .2 The Contractor and Subcontractors involved in the Work shall attend the weekly progress meetings.
- .3 The Owner will record minutes of weekly progress meetings and circulate same to attending parties within three (3) days of meeting.

1.9 Construction Safety

- .1 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.

1.10 Security

- .1 The Contractor shall be responsible for security of the Work and at the Place of the Work.

- .2 The Contractor and his Subcontractors shall make their own arrangements to ensure the security of their own equipment and materials.
- .3 The Owner, the Consultant, or other consultants 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.

1.11 Concealed or Unknown Conditions

- .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.
- .2 The record drawings provided are for information only and it is the Contractor's responsibility to verify that the actual sizes and locations of all pipes, valves, pumps and appurtenances.

1.12 Operations and Maintenance Manuals

- .1 Upon Substantial Performance of the Work, the Contractor shall submit to the Owner four (4) copies of Operating and Maintenance Manuals, containing pertinent information on maintenance, inspection, and emergency procedures, receipts, test reports, warranties, equipment and finish schedules, and other Work information.

1.13 Record Drawings

- .1 The Contractor shall keep one (1) set of current white prints of all Drawings and all addenda, revisions, clarifications, change orders, and reviewed shop drawings in the site office; and have them available at all times for inspection by the Consultant. As the work progresses, he shall record, in a neat legible manner, all changes in the work. The following information shall be recorded for each change:
 - .1 Full Description of change
 - .2 Date
 - .3 Authority
- .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 in paper and electronic format. 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. The electronic format shall be in AutoCAD version 2018 or newer.

1.14 System Demonstration

- .1 Prior to final inspection, the Contractor shall demonstrate operation of each system to the Owner and shall instruct personnel in operation, adjustment, and maintenance of equipment and systems, using data provided by operation and maintenance manuals as the basis for instruction.

1.15 Substantial Performance

- .1 Prior to or at the time of applying for a review to establish Substantial Performance of Work, the Contractor shall submit to the Consultant the following items:
 - .1 Letters of Assurance for professional design and review from those professionals

engaged by the Contractor under the provisions of the Contract, including all applicable sealed shop drawings.

- .2 All required 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 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 Drawings and as-installed documents in the form specified in the Contract Documents.
 - .7 A certificate issued by Workers Compensation Board confirming that the Contractor has paid all assessments.
- .1 Prior to Substantial Performance of the Work and in addition to the lien holdback, a deficiency holdback shall be established for Work determined by the Consultant to be defective or incomplete (the "Deficiency Holdback"). The Consultant shall establish the amount of the Deficiency Holdback as twice the estimated cost to rectify defective work and finish incomplete Work using the services of another Contractor or the Owner's own forces. No part of the Deficiency Holdback shall become payable until all of the defective Work is corrected, and all of the Work is complete. If the defective or incomplete Work is not corrected or completed within a reasonable time as determined by the Consultant, then all or a portion of the Deficiency Holdback as determined by the Consultant may be retained by the Owner to be applied against the loss and damage suffered by the Owner to correct or complete the Work.

1.16 Project Commissioning

- .1 The Contractor shall:
- .1 Promptly correct deficiencies and defects identified by the Owner.
 - .2 Review maintenance manual contents (operation, maintenance instructions, record drawings, spare parts, materials) for completeness.
 - .3 Submit required documentation such as statutory declarations, Workers' Compensation certificates, warranties, certificates of approval or acceptance from regulating bodies.
 - .4 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.
 - .5 Arrange and coordinate instruction of Owner's staff in care, maintenance and operation of building systems and finishes by suppliers or Subcontractors.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION

Section 01 11 00 Summary of Work

PART 1 GENERAL

1.1 Work Covered by Contract Documents

- .1 The work to be performed under this Contract shall include the labour, equipment and materials specified within the Contract Documents and Drawings.
- .2 The Scope of Work includes, but is not limited to, the following elements:

Phase 1- Scope of Work

- .1 All clearing, grading, excavation, and backfilling required to carry out the described works.
- .2 Construct of a concrete screening channel.
- .3 Supply and install a bar screen within the channel along with a davit crane.
- .4 Supply and install an influent duplex lift station capable of pumping 20gpm @ 20ft TDH along with its associated control panel.
- .5 Supply and install a new manhole to replace the existing influent manhole (MH-1).
- .6 Expose existing inlet pipe connecting the existing manhole to the two (2) septic tanks.
- .7 Make changes to realign the inlet pipe to split the influent flow between the two septic tanks
- .8 Install pipe to connect the new manhole to the screening channel, the screening channel to the influent duplex lift station and the lift station to the new realigned inlet pipe to the septic tanks.
- .9 Connect the overflow outlet from the influent duplex lift station by gravity to the septic tanks.

Note the above-described construction and connections are to be carried out in such a manner as to enable the existing manhole and inlet pipes to continue to transfer influent to the septic tanks until the new works are commissioned and tested.

Once the lift station overflow is connected to the septic tanks and commissioned, the influent wastewater can be rerouted from the new manhole to the screening channel and then to the septic tanks through the lift station overflow.

Once the pumping station control panel is energized (Phase 3 Contract), the screened influent wastewater can be pumped to the septic tanks. .

If possible, the contractor shall perform the described work under low-flow conditions to ensure the screening channel bypass is able to transfer the influent wastewater to the septic tanks.

As the overall construction will be completed under three separate (Phase) contracts, each of the contractors are required to communicate and coordinate their work with the other two contractors.

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While the last phase of construction will be carried out under separate contracts, there is a mutual requirement for coordination between contractors on each phase of the work. Once all the individual electrical components have been energized, commissioned and confirmed to be operational, the existing control panel and recirculating sand filter and distribution pumps can be decommissioned and removed for disposal and salvage.

- .3 The Work shall not be deemed complete until the Work is accepted by the Owner. The Work, unless specifically stated otherwise, shall include the furnishing of all labour, supervision, management, materials, installation of Owner Supplied Materials, temporary works, supplies, services, Contractor's Plant and Equipment, receiving and handling, transportation, foreign, federal, provincial, and municipal taxes, and duties of whatsoever kind, permits and licenses, and other things necessary for and incidental to the performance of all the Work. The Contractor shall advise the Owner prior to applying for any permits or licenses.
- .4 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.
- .5 The Work of the Contract consists of the construction of all Work described and as shown in the Contract Documents and by implication.
- .6 The Work may commence at the Site immediately following a Notice to Proceed. The Work is to be substantially complete by the date indicated in Section 01 32 16 - Construction Progress Schedule.

1.2 Contract Method

- .1 The Contractor shall construct the Work under a unit bid lump sum price Contract.

1.3 Responsibility

- .1 The Contractor shall be responsible for the safe-keeping of the Owner Supplied Materials and shall immediately replace or repair lost or damaged Owner Supplied Materials, including any associated equipment, appurtenances, and accessories to the complete satisfaction of the Owner and Owner at no cost to the Owner.
- .2 All Owner Supplied Materials damaged by the Contractor shall be immediately repaired or replaced by the Contractor to the satisfaction of the Owner, at no cost to the Owner.
- .3 The Contractor shall be liable for and shall indemnify the Owner against all loss and damage to Owner Supplied Materials, including all defects and deficiencies which could have been discovered at the time of receipt and inspection by the Contractor, and all costs incurred for the replacement of such materials.
- .4 The Contractor shall be responsible for all mechanical and electrical interface connections for Owner Supplied Materials and appurtenant connections.
- .5 The Contractor is responsible for completing online or in-person training in the installation of Orenco AdvanTex AX-100 Filter systems offered by Orenco and for providing all labour, equipment and supplemental specialist support necessary to ensure the proper installation (i.e., following Orenco's installation manuals), trial operation, performance testing and proof of successful operation to achieve the designated requirement.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures
- .2 Submit Project construction progress schedule in accordance with Section 01 32 16.16 -

Construction Progress Schedule.

1.5 OWNER FURNISHED EQUIPMENT

- .1 Owner Responsibilities
 - .1 Deliver supplier's bill of materials to Contractor.
 - .2 Arrange for delivery to site in accordance with Progress Schedule.
 - .3 Inspect deliveries jointly with Contractor.
 - .4 When necessary, submit claims for transportation damage.
 - .5 Arrange for replacement of damaged, defective or missing items.
 - .6 Arrange for manufacturer's field services; arrange for and deliver manufacturer's equipment to the project site.
- .2 Contractor Responsibilities
 - .1 Designate submittals and delivery date for each product in progress schedule.
 - .2 Review and submit shop drawings, product data, samples, manufacturer's instructions, and manuals to the Owner's Consultant for review.
 - .3 Submit to Consultant notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - .4 Receive and unload products on Site.
 - .5 Inspect deliveries jointly with the Owner, and record shortages, and damaged or defective items.
 - .6 Handle products on Site, including uncrating and storage.
 - .7 Protect products from damage, and from exposure to elements.
 - .8 Assemble, install, connect, adjust, and finish products.
 - .9 Repair or replace items damaged by Contractor.
- .3 Schedule of Owner Furnished Equipment
 - .1 All Owner furnished equipment are to be delivered to the Site no later than two (2) weeks after contract award. The Owner will notify the Contractor at least one (1) week prior to the final delivery date.

PART 2 PRODCUTS

- .1 Not used.

PART 3 EXECUTION

- .1 Not used.

END OF SECTION

Section 01 29 00 Measurement and Payment

PART 1 GENERAL

1.6 Measurement and Payment

- .1 The Work, including any materials, equipment, and services, will be paid for in accordance with the prices set out in the Schedule of Quantities and Prices in the RFP. The 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 the schedule 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 Section 00200. Costs of a general nature that do not pertain to any one (1) item have been distributed among all the items.

1.7 Applications for Payment

- .1 Refer to Part 18 Payment of General Conditions in MMCD Volume II

1.8 Changes in the Work

- .1 Refer to Part 7 Changes of General Conditions in MMCD Volume II

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION

Section 01 32 16 Construction Progress Schedule

PART 1 GENERAL

1.0 Description

- .1 Prior to the Owner's approval for the Contractor to commence Work at the Site, the Contractor shall produce and submit a detailed Baseline Schedule, acceptable to the Owner, which demonstrates the conformance to the requirements agreed to above and elsewhere in this Section. Once finalized and agreed to by the Owner, 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:
 - .1 Identify the work of both the Contractor and other Subcontractors that access the Site.
 - .2 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 01 33 00 – Submittals.
 - .3 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 Owner 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.

1.1 Submissions

- .1 The Contractor shall provide Submittals in accordance with Section 01 33 00 – Submittals and with the requirements noted herein.
- .2 The Owner'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:
 - .1 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 one (1) hard copy and one (1) electronic copy of the following project control documents:
 - .1 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 Owner for review. Changes in timing for activities may be modified with agreement of the Contractor and Owner. A change affecting the Contract Price, the completion time and sequencing of the Work may be made only by approved Change Order.

1.2 Project Milestone Dates

- .1 The Contractor shall schedule the Work in accordance with the Project Milestone Dates listed in the RFPs.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

Section 01 33 00 Submittal Procedures

PART 1 GENERAL

1.0 General Requirements

- .1 Unless otherwise noted, make submittals to the Owner for review.
- .2 Make submittals with reasonable promptness and in an orderly sequence to avoid any delay in the Work. Failure to submit in ample time is not considered cause for an extension of Contract Time, and no claim for extension by reason of such default will be allowed.
- .3 Do not proceed with Work affected by submittals until review is complete.
- .4 The submittal reviews do not authorize changes in cost or time. Changes involving cost or time are authorized only by a signed change order.

1.1 Shop Drawings

- .1 Arrange for the preparation of clearly identified shop drawings as specified or as the Owner may reasonably request. Shop drawings are to clearly indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of the Work. Where articles or equipment attach or connect to other articles or equipment, clearly indicate that all such attachments and connections have been properly coordinated, regardless of the trade under which the adjacent articles or equipment will be supplied and installed. Shop drawings must be submitted with the appropriate Specification Sections attached. Notify the Owner in writing of any deviations in shop drawings from the requirements of the Contract Documents.
- .2 Examine all shop drawings prior to submission to the Owner to ensure that all necessary requirements have been determined and verified and that each shop drawing has been checked and coordinated with the requirements of the Work and the Contract Documents. Examination of each shop drawing shall be indicated by stamp, date, and signature of a responsible person of the Subcontractor for supplied items and of the Contractor for fabricated items. Shop drawings not stamped, signed, and dated will be returned without being reviewed and stamped "Resubmit".
- .3 The Owner will review and return shop drawings in accordance with the schedule agreed upon or otherwise with reasonable promptness so as to cause no delay in the Work. Allow sufficient time for review and consideration by the Owner. Claims for costs or contract extensions due to such review time will not be allowed.
- .4 Submit a reproducible original or digital copy, minimum of one (1) electronic copies of white prints and two (2) copies of all fixture cuts and brochures. If the Contractor needs more copies for his own distribution purposes, additional copies should be submitted.
- .5 Shop drawing review by the Owner is solely to ascertain conformance with the general design concept. Responsibility for approval of detail design inherent in shop drawings rests with the Contractor and review by the Owner shall not imply such approval.
- .6 Review of Shop Drawings by the Owner shall not relieve the Contractor of his responsibility for errors or omissions in shop drawings or for proper completion of the Work in accordance with the Contract Documents.
- .7 Responsibility for verification and correlation of field dimensions, fabrication processes, techniques of construction, installation, and coordination of all parts of the Work rests with the Contractor.
- .8 Shop drawings will be returned to the Contractor with one (1) of the following notations:
 - .1 When stamped "NO EXCEPTIONS TAKEN", distribute additional copies as required for execution of the Work.
 - .2 When stamped "MAKE CORRECTIONS NOTED", ensure that all copies for use are

modified and distributed, same as specified for "NO EXCEPTIONS TAKEN". Resubmit for final records.

- .3 When stamped "REVISE RESUBMIT", make the necessary revisions, as indicated, consistent with the Contract Documents and submit again for review.
- .4 When stamped "REJECTED", submit other drawings, brochures, etc. for review consistent with the Contract Documents.
- .5 Only shop drawings bearing "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall be used on the Work unless otherwise authorized by the Owner.
- .6 It is understood that the following is to be read in conjunction with the wording on the Owner's shop drawing review stamp applied to each and every data sheet or drawing submitted:

"THESE (SHOP DRAWINGS) (SUBMITTALS), (PLANS)

HAVE BEEN REVIEWED FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS. NO RESPONSIBILITY IS ASSUMED BY THE OWNER FOR QUANTITIES, CORRECTNESS OR DIMENSIONS OR DETAILS."

This does not mean that the Owner approves the detail design inherent in the shop drawings, responsibility for which remains with the Contractor, and such review does not relieve the Contractor of the responsibility for errors or omissions in the shop drawing or of his responsibility for meeting all requirements of the Contract Documents. Be responsible for confirming and correlating dimensions at the Place of the Work, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all sub-trades."

- .9 After submittals are stamped "NO EXCEPTIONS TAKEN", no further revisions are permitted unless re-submitted to the Owner for further review.
- .10 Any adjustments made on shop drawings by the Owner are not intended to change the Contract Price. If it is deemed that such adjustments affect the Contract Price, clearly state as such in writing prior to proceeding with fabrication and installation of work.
- .11 Make changes in shop drawings which the Owner may require consistent with Contract Documents. When re-submitting, notify the Owner in writing of any revisions other than those requested by the Owner.
- .12 Shop drawings indicating design requirements not included in the Contract Documents require the seal of a qualified Professional Engineer, registered in British Columbia.
- .13 Only two (2) reviews of a shop drawing will be made by the Owner at no cost. Each additional review will be charged to the Contractor at the Owner's scheduled rates. The Owner's charges for additional work will be deducted from the Contractor's Progress Certificates.

1.2 Record Drawings

- .1 After award of the Contract, the Owner will provide a complete set of drawings for the purpose of maintaining Project record drawings. These drawings shall consist of a full size white paper copy.
- .2 Record on the white prints on a daily basis, work constructed differently than shown on the Contract Documents. Record all changes in the Work caused by site conditions, or originated by the Owner, the Contractor, or a Subcontractor and by addenda, supplemental drawings, site instructions, supplementary instructions, change orders, correspondence, and directions of regulatory authorities. Do not use these drawings for daily working purposes and make the set available for periodic inspection by the Owner.
- .3 Make records in a neat and legibly printed manner with a non-smudging medium.
- .4 Identify drawings as "Project Record Copy". Maintain in good condition and make available for inspection on site by Owner at all times.

- .5 At completion of operational testing, neatly transfer notations to second set of prints and submit both sets of record drawings to Owner.
- .6 Failure to provide acceptable "Record Drawings" may delay acceptance of the project by the Owner. The Owner may assess against the Contract a sum based on their calculations of costs to prepare such plans.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

Section 01 35 00 Special Project Procedures

PART 1 GENERAL

1.0 Existing Recirculation Sand Filters

- .1 The Contractor shall keep Zone 1 and as much of Zone 2 of the sand filter, as possible, in operation during the installation of the owner furnished equipment (i.e., Orenco AdvanTex AX-100 Filters). This will require the distribution pipe for the portion of Zone 2 that will remain active to be connected to the dosing system for Zone 1.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

Section 01 50 00 Temporary Facilities and Controls

1.0 GENERAL

1.1 Temporary Facilities

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

1.2 Site Requirements – General

- .1 Sanitary Facilities
 - .1 The Contractor shall:
 - .1 Provide temporary portable toilet facilities for the use of the Contractor's, subcontractors', and Owner's work forces.
 - .2 Disinfect facilities frequently.
 - .3 Dispose of sanitary wastes, in accordance with the applicable regulations.
 - .4 Contain all wastewater and later dispose of offsite at an approved facility at the Contractor's cost.
 - .5 Keep the Site and premises in a sanitary condition.
 - .6 Post notices and take such precautions as required by local health authorities or other public agency having jurisdiction.
- .2 Construction Power
 - .1 Coordinate the supply of an electrical power supply for construction purposes with BC Hydro.
 - .2 The Contractor shall:
 - .1 Locate construction power at the designated location.
 - .2 Provide and distribute construction power and lighting as required for the execution of the Work.
 - .3 Pay for its power connection, routing, consumption, and similar costs.
 - .4 Provide its own source of construction power to operate other equipment when or where necessary.
 - .5 Supply and pay for its own independent power for the Work.
 - .6 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 01 77 00 Closeout Procedures

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Not Applicable

1.2 REFERENCE STANDARDS

- .1 Not Applicable

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify the Owner and its Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request the Owner's and its Consultant's inspection.
 - .2 the Owner's Representative's and its Consultant's Inspection:
 - .1 The Owner's Representative, its Consultant and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested and fully operational.
 - .4 Operation of systems: demonstrated to Owner's personnel.
 - .5 Commissioning of mechanical systems: completed in accordance with 01 91 13 - General Commissioning Requirements and One (1) hard and one (1) digital copies of final Commissioning Report submitted to Owner and its Consultant.
 - .6 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Consultant, and Contractor.
 - .2 When Work incomplete according to the Owner and its Consultant, complete outstanding items and request re-inspection.
 - .5 Declaration of Substantial Performance: when the Owner and its Consultant considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
 - .1 When the Owner and its Consultant considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 Refer to MMCD when Work deemed incomplete by the Owner and its Consultant, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.4 FINAL CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling when appropriate in accordance with applicable local bylaw or regulation.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

END OF SECTION

Section 01 78 00 Closeout Submittals

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one (1) week before Contract completion with contractor's representative and the Owner and its Consultant to:
 - .1 Verify Project requirements.
 - .2 Review manufacturer's installation instructions and warranty requirements.
 - .2 The Owner and its Consultant to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two (2) weeks before Substantial Performance of the Work, submit to the Owner and its Consultant, two (2) final copies of operating and maintenance manuals in English.

1.4 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: Vinyl, hard covered, 3 '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.
 - .1 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 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Text: manufacturer's printed data, or typewritten data.
- .7 Drawings: Provide with reinforced punched binder tab.

- .1 Bind in with text; fold larger drawings to size of text pages.
- .8 Provide 1:1 scaled CAD files in dwg format on USB.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: As required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- .6 Training: Refer to Section 01 79 00 - Demonstration and Training.

1.6 AS-BUILT DOCUMENTS

- .1 Maintain at site for the Owner and its Consultant one (1) record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Site test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in site office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.

- .5 Keep record documents available for inspection by Consultant.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of issued for Construction drawings.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Site changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: Maintain manufacturer's certifications, inspection certifications, site test records, required by individual specifications Sections.
- .7 Provide digital photos, if requested, for site records.

1.8 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.

- .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified Section 01 91 13 - General Commissioning Requirement.
- .15 Additional requirements: As specified in individual specification Sections.

1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in 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 own expense and for review by the Owner and its Consultant.

1.10 WARRANTIES

- .1 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, Subcontractors, manufacturers, or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items.

- .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty; include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.

PART 2 PRODUCTS

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

END OF SECTION

Section 01 91 13 General Commissioning Requirements

PART 1 GENERAL

1.1 SUMMARY

- .1 This Section includes general requirements relating to commissioning (Cx) of project components and systems, specifying general requirements for performance verification (PV) of components, equipment, sub-systems, systems, and integrated systems.

1.2 RELATED REQUIREMENTS

- .1 Section 01 78 00 Closeout Submittals
- .2 Section 01 79 00 Demonstration and Training

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Consultant will observe some or all commissioning activities at their discretion.
 - .2 Owner's Performance Testing: Performance testing of equipment or systems by Consultant will not relieve Contractor from compliance with specified start-up and testing procedures.
 - .3 Cooperate fully with Consultant during stages of acceptance and occupancy of facility.
 - .4 Coordination with Authorities Having Jurisdiction (AHJ):
 - .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of AHJ, arrange for authority to witness procedures to avoid duplication of tests and to facilitate an earlier acceptance of facility.
 - .2 Obtain certificates of approval, acceptance, and compliance with applicable rules and regulations
 - .3 Submit copies to Consultant within five 5 days of test and with Cx report.
- .2 Commissioning Meetings:
 - .1 Hold Cx meetings after project meetings as indicated in this Section.
 - .2 Use Cx meetings to resolve issues, monitor progress, and identify defects and deficiencies relating to Cx.
 - .3 Continue Cx meetings on a regular basis, including during equipment start-up period, and functional testing period until commissioning deliverables have been addressed.
 - .4 At 90% construction completion stage: Consultant will request a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Agenda topics include the following:
 - .1 Review duties and responsibilities of Contractor and Subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of Subcontractors and manufacturer's representatives in the Cx process.
 - .5 Meeting will be chaired by Consultant, who will record and distribute minutes.

- .6 Ensure Subcontractors and relevant manufacturer representatives are present at 90% construction completion stage, at subsequent Cx meetings, and when otherwise required.
- .3 Observation of Starting and Testing:
 - .1 Give 14 days notice before beginning commissioning.
 - .2 Consultant will observe start-up and testing.
 - .3 The Owner & its Consultant to be present at tests performed and documented by Subcontractors, suppliers, and equipment manufacturers.
- .4 Conflicts:
 - .1 Report conflicts between requirements of this Section and other Sections to Consultant and obtain interpretation or clarification before starting commissioning work.
 - .2 Failure to report conflicts and obtain interpretation or clarification will result in application of the more stringent requirement.
- .5 Excess Administration:
 - .1 Contractor shall pay the Owner costs related to Consultant's excess contract administration if third and subsequent verifications occur where:
 - .1 Verification of reported results fail to receive Consultant's acceptance.
 - .2 Repetition of second verification again fails to receive acceptance.
 - .3 Consultant deems Contractor's request for second verification was premature.
 - .2 The cost of the Consultant's excess contract administration will be based on a rate of \$250 per hour.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit no later than four (4) weeks after award of Contract:
 - .1 The Owner & its Consultant,
 - .2 Draft Cx documentation, and
 - .3 Preliminary Cx schedule.
 - .2 Request changes to submittals in writing to Consultant and obtain written acceptance or rejection at least eight (8) weeks before start of Cx.
 - .3 Where Cx procedures are not specified, submit proposed ones to Consultant and obtain written acceptance or rejection at least eight (8) weeks before start of Cx.
 - .4 Submit additional documentation relating to Cx process as required by Consultant.
 - .5 If instruments installed in Contract will be used for Cx of TAB and PV, then submit TAB and PV instrument calibration certificates for review and acceptance.
 - .6 Submit EMCS sensor calibration certificates.
- .2 Commissioning Schedule:
 - .1 Create and submit detailed Cx schedule as part of construction schedule.
 - .2 Allow in the schedule adequate time for Cx activities prescribed in technical specification Sections and commissioning Sections including:
 - .1 Acceptance of Cx reports

- .2 Verification of reported results
- .3 Repairs, retesting, re-commissioning, and re-verification
- .4 Training
- .3 Start-Up Documentation:
 - .1 Assemble start-up documentation and submit to Consultant for review and acceptance before beginning commissioning.
 - .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up checklists.
 - .4 Start-up reports.
 - .5 Step-by-step description of complete start-up procedures so Consultant can repeat start-up at any time.
 - .4 Submit for review and acceptance:
 - .1 Complete list of proposed instruments and equipment to perform commissioning.
 - .2 List data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
 - .5 Commissioning Documentation:
 - .1 Refer to Section 01 91 13.16 - Commissioning Forms for requirements and instructions for use.
 - .2 Submit completed Cx documentation to Consultant for review and acceptance.

1.5 MAINTENANCE MATERIALS SUBMITTALS

- .1 Supply and document maintenance materials, spare parts, and special tools as specified in other specification Sections.

1.6 SITE CONDITIONS

- .1 Where Cx of weather-dependent, occupancy-dependent, or seasonally-dependent equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions if acceptable to Consultant with manufacturer's assistance in accordance with equipment manufacturer's instructions, data, and approved formulae.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Perform Cx after systems and

integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.

- .1 Objectives: Verify that installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
 - .2 Perform Cx throughout various seasons to calibrate and optimize systems under changing conditions.
 - .3 Ensure appropriate documentation is compiled into the BMM.
 - .4 Effectively train O&M staff.
- .2 Contractor shall assist in Cx process, operating equipment and systems, troubleshooting, and making adjustments as required.
- .1 Operate systems at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems should interact with each other as intended in accordance with Contract Documents and design criteria.
 - .2 Make adjustments as needed, during these checks, to enhance performance and meet environmental or user requirements.
- .3 Design Criteria: In accordance with Owner's requirements or as determined by Consultant. To meet Project functional and operational requirements.

3.2 COMMISSIONING OVERVIEW

- .1 Include Cx as a line item in Contractor's cost breakdown.
- .2 Cx activities supplement the site quality control and testing procedures described in relevant technical specification Sections.
- .3 Conduct Cx at the same time as other activities during the construction stage.
- .4 Cx identifies issues in the Design stages, which are addressed during Construction and Cx stages. This step ensures the built [facility] meets functional and operational requirements while operating as intended under weather, environmental and occupancy conditions. Cx activities include the transfer of critical knowledge to the Owner's facility operations personnel.
- .5 Consultant will issue Interim Acceptance Certificate only after:
 - .1 Cx documentation has been received, reviewed for suitability, and reviewed and accepted by Consultant,
 - .2 equipment, components and systems have been commissioned, and
 - .3 O&M training has been completed.

3.3 PRE-COMMISSIONING REVIEW

- .1 Before Construction:
 - .1 Review Contract Documents and confirm in writing to Consultant the following:
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:

- .1 Coordinate provision, location, and installation of provisions for Cx.
- .3 Before Beginning Cx:
 - .1 Verify Cx Plan and schedules are up-to-date.
 - .2 Verify installation of related components, equipment, systems, and sub-systems are complete.
 - .3 Review Cx requirements and procedures.
 - .4 Verify documentation used for the Cx process is shelf-ready (bound, organized, indexed, etc.).
 - .5 Review design criteria and intent, and special features to ensure full understanding.
 - .6 Submit complete start-up documentation to Consultant.
 - .7 Verify systems have been cleaned thoroughly.
 - .8 Complete TAB procedures on systems and submit TAB reports to Consultant for review and acceptance.
 - .9 Verify "As-Built" system schematics are available.
- .4 Inform Consultant in writing of defects and deficiencies in installed Work.

3.4 STARTING AND TESTING

- .1 Contractor to provide and pay costs of the following:
 - .1 inspections, including disassembly and re-assembly after approval, and for starting, testing, adjusting
 - .2 temporary testing equipment.

3.5 MANUFACTURER SERVICES

- .1 During factory testing, manufacturer to:
 - .1 Submit testing documentation for review and acceptance by Consultant.
 - .2 Obtain written acceptance of test results and documentation from Consultant before delivery to site.
- .2 Obtain manufacturer's installation, start-up and operations instructions before start-up of components, equipment and systems, and review with Consultant.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures that may be detrimental to equipment performance and review with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified in other divisions or where required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 Report results in clear, concise, logical manner.

3.6 COMMISSIONING PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in a normal and safe manner before conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in the following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, reviewed and accepted shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: Follow accepted start-up procedures.
 - .3 Operational testing: Document equipment performance.
 - .4 System PV: Include repetition of tests after correcting deficiencies.
 - .5 Post-Substantial Performance Verification: To include fine-tuning.
- .3 Correct deficiencies and obtain acceptance from Consultant after distinct phases have been completed and before beginning the next phase.
- .4 Document required tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Consultant. If evaluation report indicates that equipment start-up procedure was deficient and resulted in equipment damage, perform the following:
 - .1 Minor equipment/systems: Perform corrective measures acceptable to Consultant.
 - .2 Major equipment/systems: If evaluation report indicates that equipment damage is minor, perform corrective measures acceptable to Consultant.
 - .3 If evaluation report indicates that major equipment damage has occurred, Consultant will reject equipment.
 - .1 Remove rejected equipment from site and replace with new equipment.
 - .2 Perform specified start-up procedures on new equipment/systems.

3.7 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed or recommended by equipment/system manufacturer.
- .2 With manufacturer's assistance, develop written maintenance program and submit to Consultant for review and acceptance before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

3.8 TEST RESULTS

- .1 If start-up, testing, or PV produce unacceptable results, repair, replace or repeat specified starting or PV procedures until acceptable results are achieved.

- .2 Provide labour and materials, and assume costs for re-commissioning.

3.9 START OF COMMISSIONING

- .1 Notify Consultant at least 21 days before start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

3.10 TEMPORARY INSTRUMENTS AND EQUIPMENT

- .1 Provide instruments and equipment as required.

3.11 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx:
 - .1 under actual operating conditions, over entire operating range, and in all modes, and
 - .2 on independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 Make EMCS trending information available as supporting documentation for performance verification.

3.12 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with this specification Section.
 - .2 Calibration certificates have been submitted to Consultant.
- .2 Calibrated EMCS sensors may be used to obtain performance data if sensor calibration has been completed and accepted.

3.13 PROCEDURES FOR DEFICIENCIES DISCOVERED DURING COMMISSIONING

- .1 Correct defects and deficiencies found during the Cx process. Re-verify equipment and components within the defective or deficient system to verify proper performance, including related systems if requested by Consultant.
- .2 Costs associated with re-commissioning defective and deficient work is the responsibility of Contractor. Above costs to be in the form of progress payment reductions or hold-back assessments.

3.14 MISCELLANEOUS CHECKS AND ADJUSTING

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

3.15 DEFICIENCIES AND DEFECTS

- .1 Correct deficiencies and defects found during start-up and Cx to satisfaction of Consultant.
- .2 Report concerns, deficiencies, and defects affecting Cx to Consultant in writing. Stop Cx until problems are rectified. Proceed with written acceptance from Consultant.

3.16 CLOSEOUT ACTIVITIES

- .1 Completion of Commissioning:
 - .1 Upon completion of Cx, leave systems in normal operating mode.
 - .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx before issuance of Interim Certificate of Completion.
 - .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Consultant.
- .2 Activities Upon Completion of Commissioning:
 - .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.
- .3 Training:
 - .1 In accordance with Section 01 79 00 - Demonstration and Training.

END OF SECTION

Section 01 91 13.16 Commissioning Forms

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Commissioning forms to be completed for equipment, system and integrated system.
- .2 Related Requirements
 - .1 Section 01 33 00 Submittal Procedures.

1.2 COMMISSIONING FORMS

- .1 The Contractor shall demonstrate to the Owner satisfactory start up testing of all Contractor and Owner supplied equipment by completion of the following **FORM 101**.

CERTIFICATE OF SATISFACTORY EQUIPMENT PERFORMANCE FORM 101

We certify that the equipment listed below has been continuously operated for at least three consecutive days 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: _____

TAG NO: _____

REFERENCE

SPECIFICATION: _____

(Authorized Signing Representative of the Supplier)

Date

(Authorized Signing Representative of the Contractor)

Date

(Authorized Signing Representative of the Owner)

Date

PART 2 PRODUCTS

2.1 NOT USED
.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED
.1 Not Used.

END OF SECTION

Division 02 – Existing Conditions

Section 02 41 13 Selective Site Demolition

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes descriptions for demolishing, salvaging, recycling and removing site work items identified for removal in whole or in part, and for backfilling trenches and excavations resulting from site demolition activities.

1.2 RELATED REQUIREMENTS

- .1 Section 02 42 00 - Removal and Salvage of Construction Materials

1.3 PRICE AND PAYMENT PROCEDURES

- .1 This shall be a lump sum as itemized in the Section 00200 - Schedule of Quantities and Prices.

1.4 DEFINITIONS

- .1 Selective Demolition: Sequencing demolition activities to allow separation and sorting of selected site materials.

1.5 REFERENCE STANDARDS

- .1 Not used

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Demolition Meetings.
 - .1 Convene pre-installation meeting one (1) week before beginning work of this Section with Contractor and the Owner & its Consultant in accordance to:
 - .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work
 - .3 Coordinate with other construction sub trades
 - .4 Examine existing site conditions adjacent to demolition work, prior to start of Work
 - .5 Waste reporting requirements

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following submittals in accordance with Section 01 33 00 - Submittal Procedures before starting any work of this Section:
 - .1 Submit for review and approval selective site demolition drawings, diagrams or details showing sequence of selective site demolition.
 - .2 Schedule of Selective Site Demolition Activities:
 - .1 Detailed sequence of selective site demolition and removal work, with starting and ending dates for each activity

1.8 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.
- .2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.

1.9 SITE CONDITIONS

- .1 Environmental protection:
 - .1 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .2 Fires and burning of waste or materials is not permitted on site.
 - .3 Burying of rubbish waste materials is not permitted.
 - .4 Disposal of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum-based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers, is not permitted.
 - .5 Ensure proper disposal procedures are maintained throughout the project.
- .2 Pumping of water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties, is not permitted.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with applicable regulations and as directed by the Owner & its Consultant.
- .4 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .5 Conduct selective site demolition so the WWTP plant operations will not be disrupted:
 - .1 Provide not less than 72 hours' notice to Owner of activities that will affect operations.
 - .2 Maintain access to existing walkways, exits, and other adjacent occupied or used facilities:
 - .1 Closing or obstructing walkways, exits, or other occupied or used facilities without written permission from the Owner is not permitted.
- .6 The Owner & its Consultant assume no responsibility for Selective Site elements being demolished:
 - .1 Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - .2 Before selective site demolition, remove, protect and store salvaged items as directed by Owner:
 - .1 Salvage items as identified by Owner.
 - .2 Deliver to Owner as directed.

1.10 EXISTING CONDITIONS

- .1 Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work:

- .1 Hazardous materials will be as defined in the Hazardous Materials Act.
- .2 Hazardous materials will be removed by Owner before start of the Work.
- .2 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the Owner & its Consultant. Hazardous materials will be removed by Owner or by Contractor under a separate contract or as a change to the Work.
- .3 Site elements that will be demolished are based on their condition at time of examination prior to tendering.

PART 2 PRODUCTS

- .1 Not used

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of selective site demolition required.
- .2 The Owner & its Consultant do not guaranty that existing conditions are the same as those indicated in Project Record Documents.
- .3 Inventory and record the condition of items being removed and salvaged.
- .4 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to the Owner & its Consultant.
- .5 Verify that hazardous materials have been remediated before proceeding with site demolition operations.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to applicable regulations.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
- .2 Protection of in-place conditions:
 - .1 Prevent movement, settlement or damage of adjacent elements
 - .1 Provide bracing, shoring as required.

- .2 Repair damage caused by demolition as directed by the Owner & its Consultant.
- .2 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

3.3 REMOVAL AND DEMOLITION OPERATIONS

- .1 Remove items as indicated.
- .2 Disruption of items designated to remain in place is not permitted.
- .3 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.
- .4 Stockpile topsoil for final grading and landscaping:
 - .1 Provide erosion control and seeding if not immediately used.
- .5 Salvage:
 - .1 Items to be salvaged: suitable topsoil and fill materials for reuse.
 - .2 Dismantle items containing materials for salvage and stockpile salvaged materials at locations as directed.
- .6 Disposal of Material:
 - .1 Dispose of materials not designated for salvage or reuse on site as instructed by the Owner at authorized facilities.

3.4 STOCKPILING

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.5 REMOVAL FROM SITE

- .1 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

3.6 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.
- .2 Use 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.

3.7

CLEANING

- .1 Progress Cleaning: clean
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
 - .3 Use 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.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Section 02 42 00 Removal And Salvage Of Construction Materials

PART 1 GENERAL

1.1 SUMMARY

- .1 This Section includes requirements for careful removal and salvage the existing sand filter and pipes.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 13 Selective Site Demolition

1.3 DEFINITIONS

- .1 Remove and Salvage: Detach items from existing construction and disposed or stored as directed by Owner.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordinate with Owner for confirmation of materials, components, and items of equipment identified for removal and salvage from their present existing locations and as follows:
 - .1 Items that are turned over to Owner.
 - .2 Storage locations.
 - .3 Confirmation of items that Owner will not re-use, but will retain

PART 2 PRODUCTS

2.1 SALVAGED ITEMS

- .1 Items salvaged by Contractor and retained by Owner includes pumps and valves.
- .2 Confirm with Owner additional items that appear salvageable prior to disposal.

PART 3 EXECUTION

3.1 SALVAGE

- .1 Remove and handle salvageable items from site to minimize damage and to ensure that usability is maintained.
- .2 Clean, decontaminate, or remediate hazardous substances (lead-based paint, asbestos dust, PCB residue, and similar substances) from salvaged materials so they are safe for reuse.
- .3 Place materials on pallets or wrap in protective film to ensure that loose pieces and projections do not cause injury to personnel, and that salvaged items remain as complete units.
- .4 Clean items of construction or building debris, or materials that are not a part of salvaged work before delivering to the storage location as directed by Owner.

END OF SECTION

Division 11 – Process Equipment

Section 11 02 00 Manual Bar Screen

PART 1 GENERAL

1.1 Summary

- .1 Supply and installation of one (1) 304 stainless steel manual bar screen with 12 mm openings and one (1) manual davit crane and base fabricated by Claro Environmental Technologies or approved equivalent.
- .2 Vendor contact information is provide below:

<p>Peter Lipert General Manager Claro Environmental Technologies 514.562.4575 pjr@claroglobal.com</p>

1.2 Submittals

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 01 78 00 Closeout Submittals.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
 - .2 Indicate dimensions, construction details and materials for specified items.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Commissioning Plan four (4) weeks prior to commissioning.
- .7 Closeout submittals
 - .1 Submit maintenance and engineering data for incorporation into manual
 - .2 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year, and capacity.
 - .3 Details of operation, servicing, and maintenance.
 - .4 Recommended spare parts list.
 - .5 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.

- .6 Valves schedule and flow diagram.
- .7 Colour coding chart.
- .6 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .7 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
- .8 Approvals:
 - .1 Submit One (1) soft copy of Operation and Maintenance Manual to Owner's Consultant for review and approval. Submission of individual data will not be accepted unless directed by Owner's Consultant.
- .9 Submit two (2) hard and one (1) soft copies of completed as-built drawings with final Operating and Maintenance Manuals.

1.3 Operation and Maintenance Data

- .1 The Contractor shall prepare and assemble detailed operation and maintenance manuals. It shall contain data that shall include but not be limited to the following:
 - .1 Preventative maintenance procedures.
 - .2 Trouble-shooting.
 - .3 Testing.
 - .4 Replacement of components.

1.4 Quality Assurance

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting prior to beginning work of this Section and on-site installations.
 - .1 Include Claro representative.
 - .2 Verify project requirements.
 - .3 Review installation and substrate conditions.
 - .4 Co-ordination with other subtrades.
 - .5 Review manufacturer's installation instructions and warranty requirements.
 - .2 Installer required to be completed necessary training offered by Orenco.

1.5 Delivery, Storage and Handling

- .1 Delivery, storage, and handling to be in accordance with equipment manual.

1.6 Warranty

- .1 Installation to be in accordance with equipment manual to avoid voiding warranty.

PART 2 PRODUCTS

2.0 Materials

- .1 All materials shall be 304 stainless steel.

2.1 Openings

- .1 The size of screen openings is 12 mm.

2.2 Davit Crane

- .1 Type A, 500 kg capacity manual davit crane and base or approved equal.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

- .1 Compliance: Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 Installation

- .1 Install in accordance with manufacturer's instructions and as specified.

3.3 Start-up and Commissioning

- .1 Start-up and commissioning to be done by a certified factory Technician and in accordance with Section 01 91 13 General Commissioning Requirements.

END OF SECTION

Section 11 03 00 Packaged Lift Station

PART 1 GENERAL

1.1 Summary

- .1 Supply and installation of One (1) package Lift Station with (2) two grinder pumps fabricated by Engineered Pump Systems Ltd located in Port Coquitlam, BC or approved equivalent.
- .2 Vendor contact information is provide below:

Cole Bunke Engineered Pump Systems Ltd 604.552.7900 cbunke@engineeredpump.com
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1.2 Submittals

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 01 78 00 Closeout Submittals.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
 - .2 Indicate dimensions, construction details and materials for specified items.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories for the Consultant review and approval.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Commissioning Plan four (4) weeks prior to commissioning.
- .7 Closeout submittals
 - .1 Submit maintenance and engineering data for incorporation into manual
 - .2 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year, and capacity.
 - .3 Details of operation, servicing, and maintenance.
 - .4 Recommended spare parts list.
 - .5 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.

- .7 Colour coding chart.
- .6 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .7 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
- .8 Approvals:
 - .1 Submit One (1) soft copy of Operation and Maintenance Manual to Owner's Consultant for review and approval. Submission of individual data will not be accepted unless directed by Owner's Consultant.
- .9 Submit two (2) hard and one (1) soft copies of completed as-built drawings with final Operating and Maintenance Manuals.

1.3 Operation and Maintenance Data

- .1 The Contractor shall prepare and assemble detailed operation and maintenance manuals. It shall contain data that shall include but not be limited to the following:
 - .1 Preventative maintenance procedures.
 - .2 Trouble-shooting.
 - .3 Testing.
 - .4 Replacement of components.

1.4 Quality Assurance

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting prior to beginning work of this Section and on-site installations.
 - .1 Include Orenco representative.
 - .2 Verify project requirements.
 - .3 Review installation and substrate conditions.
 - .4 Co-ordination with other building subtrades.
 - .5 Review manufacturer's installation instructions and warranty requirements.
 - .2 Installer required to be completed necessary training offered by Orenco.

1.5 Delivery, Storage and Handling

- .1 Delivery, storage, and handling to be in accordance with equipment manual.

1.6 Warranty

- .1 Installation to be in accordance with equipment manual to avoid voiding warranty.

PART 2 PRODUCTS

2.0 Materials & Technical Requirements

- .1 Tank: FRP
- .2 Pump: Cast Iron and grinder type, Zoeller or approved equal
- .3 Piping, fitting and valves to be PVC Sch 80 certified to the current applicable CSA standards.
- .4 Control Panel: NEMA 4X enclosure

2.1 Technical Requirements

- .1 Tank size: approximately 36" x 72" depth
- .2 Pump: 20 gpm at 20ft TDH

PART 3 EXECUTION

3.1 Manufacturer's Instructions

- .1 Compliance: Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 Installation

- .1 Install in accordance with manufacturer's instructions and as specified.
- .2 Seams and penetrations to be watertight.

3.3 Control Panel

- .1 Installation to be performed by a licensed and qualified electrician.

3.4 Backfill

- .1 Slope finished grade way from units.

3.5 Start-up and Commissioning

- .1 Start-up and commissioning to be done by a certified factory Technician and in accordance with Section 01 91 13 General Commissioning Requirements.

END OF SECTION

Division 31 – Earthwork

Section 31 00 00.01 Earthwork and Related Work

PART 1

GENERAL

1.1

REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A3000, Cementitious Materials Compendium.

1.2

QUALITY ASSURANCE/REGULATORY REQUIREMENTS

- .1 Shore and brace excavations protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.
- .2 Comply with Explosives Act of Canada.
- .3 Perform blasting in accordance with Provincial and Municipal regulations. Repair damage to approval of Owner's Representative.
- .4 No blasting will be permitted within 3 m of any building and where damage would result.

1.3

TESTS AND INSPECTIONS

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Owner's Representative.
- .2 Not later than one (1) week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill for fill material proposed for use.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Owner's Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Owner's Representative so that compaction tests can be carried out by designated testing agency.
- .5 Before commencing work, conduct, with Owner's Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey benchmarks and monuments which may be affected by work.

1.4

EXISTING CONDITIONS

- .1 Examine soil report available from Owner's Representative.
- .2 Before commencing work verify the location of all buried services on and adjacent to the site.

- .3 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.
- .4 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Granular B-Type I, B-Type II, Select Subgrade to OPSS1010. Sand to OPSS1004.
- .2 Crushed Granular to CCDG14.02.
- .3 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum Portland cement content of 25 kg/m³.
 - .3 Minimum strength of 0.07 MPa at 24 h.
 - .4 Concrete aggregates: to CSA-A23.1/A23.2,
 - .5 Cement: to CSA A3000, Type GU.
 - .6 Slump: 160 to 200 mm.

PART 3 EXECUTION

3.1 PROTECTION/PROTECTION

- .1 Protect excavations from freezing.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's Consultants approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.2 CLEARING AND GRUBBING

- .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
- .2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.
- .3 Dispose of cleared and grubbed material off site daily to disposal areas acceptable to authority having jurisdiction.

3.3 EXCAVATION

- .1 Shore and brace excavations protect slopes and banks and perform work in accordance with Provincial regulations.

- .2 Perform blasting in accordance with Provincial regulations: repair damage as directed by Owner's Representative.
- .3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .1 Stockpile topsoil on site for later use.
- .4 Excavate as required to carry out work, in all materials met.
 - .1 Do not disturb soil or rock below bearing surfaces.
 - .2 Notify Owner's Representative when excavations are complete.
 - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work. Excavation taken below depths shown without Owner's Representative written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .5 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
 - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .6 Excavate for slabs and paving to subgrade levels.
 - .1 In addition, remove all topsoil, organic matter, debris, and other loose and harmful matter encountered at subgrade level.

3.4 BACKFILLING

- .1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Owner's Representative.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill.
 - .1 Fill excavated areas with selected subgrade material or gravel and sand compacted as specified for fill.
- .5 Placing:
 - .1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.
- .6 Compaction: compact each layer of material to following densities for material to ASTM D698,
 - .1 To underside of basecourses: 95%.
 - .2 Basecourses: 100%.

- .3 Elsewhere: 90%.
- .7 In trenches:
 - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
 - .2 Over 300 mm above pipe or conduit: native material approved by Owner's Representative.
- .8 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .9 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.
- .10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.
- .11 Underground tanks: use sand to bottom of granular basecourses or to bottom of topsoil, as applicable.

3.5 GRADING

- .1 Grade so that water will drain away from buildings, walls, and paved areas, to catch basins and other disposal areas approved by the Owner's Representative.
 - .1 Grade to be gradual between finished spot elevations shown on drawings.

3.6 SHORTAGE AND SURPLUS

- .1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 Dispose of surplus material off site.

3.7 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

END OF SECTION

Section 31 05 10 Corrected Maximum Dry Density for Fill

PART 1 GENERAL

1.1 SUMMARY

- .1 This Section defines correction to maximum dry density to take into account aggregate particles larger than 4.75 mm.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C127-88, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .2 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600kN-m/m³).
 - .3 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
 - .4 ASTM D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.3 DEFINITIONS

- .1 Corrected maximum dry density is defined as:
 - .1 $D = (D1 \times D2) / (F1 \times D2 + (F2 \times D1))$
 - .2 Where: D = corrected maximum dry density kg/m³.
 - .1 F1 = fraction (decimal) of total field sample passing 4.75 mm sieve.
 - .2 F2 = fraction (decimal) of total field sample retained on 4.75 mm sieve (equal to 1.00 - F1)
 - .3 D1 = maximum dry density, kg/m³ of material passing 4.75 mm sieve determined in accordance with Method A C of ASTM D698.
 - .4 D2 = bulk density, kg/m³, of material retained on 4.75 mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127.
 - .3 For free draining aggregates, determine D1 (maximum dry density) to ASTM D4253, dry method when directed by Owner's Representative.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

Section 31 23 33.01 Excavating, Trenching and Backfilling

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 02 41 13 - Selective Site Demolition
- .3 Section 11 01 00 Orenco AX-100 Cloth Filter Package

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C 117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D 698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CA/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.3 DEFINITIONS

- .1 Excavation classes: two (2) classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock excavation: excavation of material from solid masses of igneous, sedimentary, or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m³. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in work.

- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.
- .4 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of work.
- .6 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

<u>Sieve Designation</u>	<u>%Passing</u>
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
<u>0.005 mm</u>	<u>0-45</u>

- .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

1.4 SUBMITTALS

- .1 Inform Owner's Representative at least four (4) weeks prior to commencing work, of proposed source of fill materials and provide access for sampling.
- .2 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
- .3 Ship samples as directed by Owner's Representative in tightly closed containers to prevent contamination.

1.5 QUALITY ASSURANCE

- .1 Submit design and supporting data at least two (2) weeks prior to commencing work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the province of British Columbia.
- .3 Keep design and supporting data on site.

- .4 Engage services of qualified professional engineer who is registered or licensed in Province of Newfoundland and Labrador to design and inspect cofferdams, shoring, bracing, and underpinning required for work.
- .5 Do not use soil material until written report of soil test results are reviewed and approved by Owner's Representative.

1.6 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to commencing excavation work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
 - .6 Confirm locations of buried utilities by careful test excavations.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Owner's Representative before removing or re-routing.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
 - .1 Conduct, with Owner's Representative condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey benchmarks and monuments which may be affected by work.
 - .2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Owner's Representative.

- .3 Where required for excavation, cut roots or branches as approved by Owner's Representative.

PART 2 PRODUCTS

2.0 MATERIALS

- .1 Backfill Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregates for Earthwork and the following requirements:

- .1 Crushed, pit run or screened stone, gravel, or sand.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	%Passing	
	<u>Type1</u>	<u>Type2</u>
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
<u>0.075 mm</u>	<u>3-8</u>	<u>0-10</u>

- .2 Type 3 fill: selected material from excavation or other sources, approved by Owner's Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 EXECUTION

3.1 SITE PREPARATION

- .1 Remove obstructions, ice, and snow, from surfaces to be excavated within limits indicated.

3.2 PREPARATION/PROTECTION

- .1 Protect existing features as required.

- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage. Protect buried services that are required to remain undisturbed.

3.3 STRIPPING OF TOPSOIL

- .1 Commence topsoil stripping of areas as indicated by Owner's Representative after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as indicated by Owner's Representative. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Owner's Representative. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil as directed by Owner's Representative.

3.4 STOCKPILING

- .1 Stockpile fill materials in areas designated by Owner's Representative. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Occupational Health and Safety Act for the Province of British Columbia.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Construct temporary works to depths, heights and locations as indicated or approved by Owner's Representative.
- .4 During backfill operation:
 - .1 Unless otherwise as indicated or as directed by Owner's Representative remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.
- .5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .6 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.

- .2 Remove excess materials from site and restore water courses as indicated and as directed by Owner's Representative.

3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Submit for Owner's Representative's review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in manner not detrimental to public and private property, or any portion of work completed or under construction.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

3.7 EXCAVATION

- .1 Excavate to lines, grades, elevations, and dimensions as indicated by Owner's Representative.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, unless otherwise authorized by Owner's Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .6 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Owner's Representative.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft, or organic matter.
- .11 Notify Owner's Representative when bottom of excavation is reached.

- .12 Obtain Owner's Representative approval of completed excavation.
- .13 Remove unsuitable material from trench bottom to extent and depth as directed by Owner's Representative.
- .14 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected maximum dry density.
- .15 Hand trim make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Owner's Representative.

3.8 FILL TYPES AND COMPACTION

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698 corrected maximum dry density.
 - .1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95%.
 - .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 98%.
 - .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100%.
 - .4 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 95%. For remaining portion, use Type 3 fill compacted to 95%.
 - .5 To correct over excavation in trenches: use Type 2 fill to underside of sand bedding compacted to 95%.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

- .1 Vibratory compaction equipment: approved by Owner's Representative.
- .2 Do not proceed with backfilling operations until Owner's Representative has inspected and approved installations.
- .3 Areas to be backfilled to be free from debris, snow, ice, water, and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow, or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing

succeeding layer.

- .6 Backfill around installations.
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or overcast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 600 mm.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures.
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure, and approval obtained from Owner's Representative, or
 - .2 If approved by Owner's Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Owner's Representative.

3.11 RESTORATION

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Owner's Representative.
- .2 Replace topsoil as indicated by Owner's Representative.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavement and sidewalks disturbed by excavation to thickness, structure, and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by work as directed by Owner's Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 h.

END OF SECTION

Division 33 – Utilities

Section 33 31 11 Sanitary Sewer and Force Main

1.0 GENERAL

1.1 RELATED WORK

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 61 00 – Common Product Requirements
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 31 05 16 – Aggregates for Earthwork.
- .5 Section 31 23 33.01 - Excavating Trenching and Backfilling.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C117, Standard Test Method for Material Finer Than 75 [MU] m (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft⁴-lbf/ft³ (600 kN-m/m³)).
 - .4 ASTM D3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .2 Canadian General Standards Board (CGSB). CSA B137, Thermoplastic Pressure Piping Compendium.
 - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B137, Thermoplastic Pressure Piping Compendium.
 - .2 CSA B1800, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
 - .1 CSA B182.2, PVC Sewer Pipe and Fittings (PSM Type).
 - .2 CSA B182.11, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

1.3 DEFINITIONS

- .1 Pipe section is defined as length of pipe between successive manholes and/or between manhole and any other structure which is part of sewer system.

1.4 SUBMITTALS

- .1 Shop drawings to indicate proposed method for installing carrier pipe for undercrossing.
- .2 Inform Owner's Representative at least four (4) weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .3 Submit manufacturer's test data and certification at least two (2) weeks prior to beginning Work.
- .4 Ensure certification is marked on pipe.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's recommendations

1.6 RECORD DRAWINGS

- .1 Provide record drawings, including directions of operating valves, list of equipment required to operate valves, details of pipe materials, location of air and vacuum release valves, maintenance, and operating instructions in accordance with Section 01 78 00 – Closeout Submittals.

1.7 SCHEDULING

- .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
- .3 Notify Owner's Representative and building manager superintendent two (2) working days in advance of any interruption in service.

2.0 PRODUCTS**2.1 PLASTIC PIPE**

- .1 Type PSM Polyvinyl Chloride (PVC): to ASTM D3034.
 - .1 Separate gasket and integral bell system.
 - .2 Nominal lengths: 6.0 m.

2.2 SERVICE CONNECTIONS

- .1 Type PSM Poly (Vinyl) Chloride: to CAN/CSA-B182.2.
- .2 Plastic: to CAN/CSA B182.1, with push-on-joints.

2.3 FORCE MAINS

- .1 50 mm diameter Schedule 80 PVC pipe and fittings to applicable CSA standards

2.4 PIPE BEDDING AND SURROUND MATERIALS

Granular material to Section 31 05 16 – Aggregates for Earthwork and following requirements:

- .1

- .1 Crushed or screened stone, gravel, or sand.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

.2 Table

Sieve Designation	% Passing Stone/Gravel	% Passing Gravel/Sand
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	100	-
19 mm	-	-
12.5 mm	65-90	100
9.5 mm	-	-
4.75 mm	35-55	50-100
2.00 mm	-	30 - 90
0.425 mm	10-25	10 - 50
0.180 mm	-	-
0.075 mm	0-8	0-10

- .3 Concrete mixes and materials for cradles, encasement, supports to Section 03 30 00 - Cast-in-Place Concrete.

2.5 BACKFILL MATERIAL

- .1 Type 3, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.0 EXECUTION**3.1 PREPARATION**

- .1 Clean and dry pipes and fittings before installation.
- .2 Obtain approval of pipes and fittings from Owner's Representative prior to installation.

3.2 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Do not allow contents of any sewer or sewer connection to flow into trench.
- .3 Trench alignment and depth require approval of Owner's Representative prior to placing bedding material and pipe.

3.3 CONCRETE BEDDING AND ENCASEMENT

- .1 Do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete. Place concrete to details as directed by Owner's Representative.
- .2 Position pipe on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- .3 Do not backfill over concrete within 24 hours after placing.

3.4 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 95 % maximum density to ASTM D698.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.5 INSTALLATION

- .1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Owner's Representative.
- .2 Handle pipe using methods approved by Owner's Representative. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

- .3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Tolerances: 3mm in 3 m.
- .4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .6 Do not allow water to flow through pipe during construction, except as may be permitted by Owner's Representative.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CSA B182.11.
- .9 Pipe jointing:
 - .1 Install gaskets in accordance with manufacturer's recommendations.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel, and other foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned, and lubricated and replaced before joining is attempted.
 - .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
 - .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .10 When stoppage of Work occurs, block pipes as directed by Owner's Representative to prevent creep during down time.
- .11 Plug lifting holes with pre-fabricated plugs approved by Owner's Representative, set in shrinkage compensating grout.
- .12 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available.
- .14 Use prefabricated saddles or field connections approved by Owner's Representative, for connecting pipes to existing sewer pipes. Joints to be structurally sound and watertight.

3.6 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Owner's Representative has inspected pipe joints, surround and cover pipes as indicated. Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 1.0 m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95 % maximum density to ASTM D698.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % corrected maximum density to ASTM D698.
- .7 When field test results are acceptable to Owner's Representative, place surround material at pipe joints.

3.7 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 95 % maximum density to ASTM D698. In other areas, compact to at least 90 % maximum density to ASTM D698.

3.8 SERVICE CONNECTION

- .1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.
- .2 Maintain grade for sewers at one (1) vertical to 50 horizontal unless directed otherwise by Owner's Representative.
- .3 Service connection pipe: not to extend into interior of main sewer.
- .4 Make up required horizontal and vertical bends from 45 degrees bends or less, separated by straight section of pipe with minimum length of four pipe diameters.
 - .1 Use long sweep bends where applicable.

3.9 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Owner's Representative, draw tapered wooden plug with diameter of 10 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.

- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- .5 Do infiltration and exfiltration testing as specified herein and as directed by Owner's Representative. Perform tests in presence of Owner's Representative. Notify Owner's Representative two (2) working days in advance of proposed tests.
- .6 Carry out tests on each section of sewer between successive manholes including service connections.
- .7 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- .8 Exfiltration test:
 - .1 Fill test section with water to displace air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are begun.
 - .2 Immediately prior to test period add water to pipeline until there is head of 1.0 m over interior crown of pipe measured at highest point of test section or water in manhole is 1.0 m above static ground water level, whichever is greater.
 - .3 Duration of exfiltration test: two (2) hours.
 - .4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.
- .9 Infiltration test:
 - .1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.
 - .2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.
 - .3 Install watertight plug at upstream end of pipeline test section.
 - .4 Discontinue pumping operations for at least three (3) days before test measurements are to begin and during this time, keep thoroughly wet at least one (1) third of pipe invert perimeter.
 - .5 Prevent damage to pipe and bedding material due to flotation and erosion.
 - .6 Place 90 degrees V-notch weir, or other measuring device

approved by Owner's Representative in invert of sewer at each manhole.

- .7 Measure rate of flow over minimum of one (1) hour, with recorded flows for each five (5) min interval.
- .10 Infiltration and exfiltration not to exceed 5.5 L per hour per 100 m of pipe, including service connections.
- .11 Repair visible leaks regardless of test results.
- .12 Television and photographic inspections: carry out inspection of installed sewers by television camera, photographic camera or by other related means.
- .13 Provide certification of test acceptance. Provide Owner's Representative with copy of video tape, VHS format and certification of corrected deficiencies. If retesting is required Contractor to pay cost.

END OF SECTION