Stantec

Parks Canada Agency

# System Assessment and Rehabilitation Infrastructure Upgrades

# Technical Specifications

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| DISCIPLINE | DATE | STAMP |
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| Civil Specifications: | October 11, 2019 | THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF THE PROVINCE OF PRINCE EDWARD ISLAND VALID FOR THE YEAR 2019 Darrell P. Fisher No. 483 DATE: 2019-Oct-11 LICENSED PROFESSIONAL ENGINEER PROVINCE OF PRINCE EDWARD ISLAND |
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**END OF SECTION**

**Division 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS**



**Division 01 - GENERAL REQUIREMENTS**



**Division 26 – ELECTRICAL**

**Division 31 - EARTHWORK**



**Division 32 – EXTERIOR IMPROVEMENTS**



**Division 33 - UTILITIES**



**APPENDICES**

**(To be provided as Supplementary Information after award)**



**Drawing Index**



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## Part 1 General

### 1.1 ROLES, RESPONSIBILITIES AND DEFINITIONS

.1 All references to the Departmental Representative shall mean:

.1 A representative of Parks Canada.

.2 All references to Owner shall mean:

.1 Parks Canada.

### 1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 The Work of this Contract generally includes the supply and installation of all labour, services, materials, testing and equipment to complete the System Assessment and Rehab Infrastructure Upgrades project (the Work) as indicated on the drawings and Work as indicated herein. The Work includes upgrades to the Brackley Beach water supply system, and upgrades to the SPLJFA sanitary and storm systems. The work shall include but is not limited to:

.1 Adherence to the BIA.

.2 Site mobilization/demobilization.

.3 Materials testing and quality control.

.4 Supply and installation of temporary utilities and construction facilities as required including subsequent removal from site.

.5 Submission of a record information package including mark-ups, a construction survey and a warranty and maintenance plan.

.6 Completion of water supply system upgrades at Brackley Beach, including:

.1 Supply and installation of new well pump as indicated on the Drawings.

.2 Supply and installation of new water supply pipe, including connection to existing water supply system, as indicated on the Drawings.

.3 Supply and installation of new flow control valve as indicated on the Drawings.

.4 Supply of buried conduits and cables for connection of the Water Well System components and control panel. Overhead power lines are not permitted on this site. All electrical lines must be contained either underground or inside site buildings.

.7 Completion of sanitary and storm system upgrades and SPLJFA, including:

.1 Removal of existing infrastructure as indicated on the Drawings, including storm sewer pumping station, sanitary lift station, storm sewer piping, and electrical services.

.2 Supply and installation of new catch basin as indicated on the Drawings.

.3 Supply and installation of new infiltration chambers and end caps, complete with geogrid and geotextile, as indicated on the Drawings.

.4 Supply and installation of storm sewer pipe, including connection to existing as indicated on the Drawings.

.5 Construction of vegetated swale from new catch basin to existing swale, as indicated on the Drawings.

.6 Supply and installation of new sanitary lift station, including pumps, connection to existing services, and electrical services as indicated on the Drawings.

.8 Construction, including: clearing, grubbing, stripping, excavation, bedding of pipe, backfill, site restoration, and site preparation as indicated on the Drawings.

.9 Supply, placement, and compaction of bedding and cover material for installation of piping.

.10 General reinstatement and clean-up.

## 1.3 WORK SEQUENCE

.1 Contractor to construct the Work in a continuous sequence upon contract award.

## 1.4 CONTRACTOR USE OF PREMISES

.1 Contractor must only work in designated work site locations and work access travel corridors which include approved roadways and trails only. The corridors and work site will be marked and agreed upon by Parks Canada and Constructor prior to commencing construction. Absolutely no damage outside of these limits is to occur by the Contractor.

.2 Contractor will have joint use of this property with Parks Canada during the construction period and must ensure all construction activities in overlapping areas are well coordinated in advance.

.3 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.4 At completion of Construction, return disturbed areas to equal condition or better condition than existed before Work started.

## 1.5 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING FACILITIES

.1 Execute work with least possible interference or disturbance to existing operations and normal use of premises. Arrange with Departmental Representative and Owner to facilitate execution of work.

## 1.6 EXISTING SERVICES

.1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Give the Owner 48 hours of notice for necessary interruption of services throughout course of work. Minimize duration of interruptions.

.3 Contractor shall request the locations and extents of existing service lines in area of work from appropriate utility companies prior to starting work. Report to be submitted to Owner outlining the locations and extents of existing service lines in area of work.

.4 Submit schedule to and obtain approval from Owner for any shut-down or closure of active service. Adhere to approved schedule and provide notice to affected parties.

.5 Where unknown services are encountered, immediately advise Owner and confirm findings in writing.

.6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.7 Record locations of maintained, re-routed and abandoned service lines.

## 1.7 CONSTRUCTION SURVEYING SERVICES

.1 Acquire the services of a Construction Surveyor to establish an accurate location of the installation of new Works within the construction area. Construction Surveyor must be approved by Departmental Representative prior to commencement of surveying services.

.2 Prior to commencing with infrastructure confirmations and locations, all parties involved with the test excavation should visit the site and become acquainted with current site conditions.

.3 Contractor shall have reference points established on site by the Construction Surveyor.

.4 Contractor shall record horizontal and vertical coordinates of all abandoned, capped, new and existing exposed utilities within the open trench area prior to backfilling operations.

.5 Contractor shall survey all new Works installed above and below grade. An as-built topographic survey shall be submitted to the Departmental Representative for approval in order to obtain Substantial Performance of the Work. The submittal shall include an ASCII or .csv raw points file and an AutoCAD file in dwg format.

## 1.8 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy of each document as follows:

- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Erosion and Sedimentation Control Plan.
- .12 Traffic Plan.

.13 Other documents as specified.

**Part 2 Products**

**2.1 NOT USED**

.1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## Part 1 General

### 1.1 GENERAL REQUIREMENTS OF THE BID AND ACCEPTANCE FORM

.1 Unit prices and Lump Sum prices bid are full compensation for the work necessary to complete each item in the Contract and in combination for all work necessary to complete the Work as a whole.

.2 All measurement shall be along a horizontal plane unless otherwise indicated.

.3 Overhaul will not be paid for on this project.

.4 The quantities listed in the Bid and Acceptance Form are approximate only and are for the purpose of tendering. Payment to the Contractor will be based on actual quantities of work completed in accordance with the Drawings and specifications.

.5 The numbers of the items described below correspond to the items in the Bid and Acceptance Form.

.6 There will be no measurement of payment for Work carried out beyond the limits defined on the Drawings.

### 1.2 MEASUREMENT AND PAYMENT

.1 All items in this contract will be paid for as indicated in the bid items below:

.2 Brackley Well Commissioning:

.1 Unit Price Item 1 – Supply of submersible groundwater well pump – Grundfos SP 77S15-3 1.5 HP submersible pump or approved alternative

.1 Unit of Measurement: each.

.2 Method of Measurement: Measurement to be per the number of supplied submersible groundwater well pumps, as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply the submersible groundwater well pump as shown on the Drawings.

.2 Lump Sum Price Item 2 – Well pump installation and connection, including MAASS pitless adapter installation

.1 Unit of Measurement: lump sum.

.2 Method of Measurement: Measurement to be the complete installation and connection of the submersible groundwater well pump, including installation of MAASS pitless adapter, as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to install and connect submersible groundwater well pump and to supply and install pitless adapter, and shall include all excavation, bedding, compaction and backfill necessary for the complete connection.

.3 Unit Price Item 3 – Valve Chamber

.1 Unit of Measurement: each

.2 Method of Measurement: Measurement to be based on units installed of each dimension, and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the complete valve chamber, and shall include all excavation, bedding, compaction, connections to existing and backfill necessary for the complete installation. Payment shall include removal of existing pipe material where alignment matches the proposed pipe alignment.

.4 Unit Price Item 4 – 100mm PVC DR 28 excavated water main

.1 Unit of Measurement: lineal meters (m).

.2 Method of Measurement: Measurement to be lineal meters along the centerline of the installed water main, through valves and fittings, and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the water main, and shall include all excavation, bedding, compaction and backfill and testing necessary for the complete installation.

.5 Unit Price Item 5 – Supply and installation of flow control valve – Cla-Val Model 40-01, 4", threaded and flanged, ductile iron body to ASTM A536 or approved alternative.

.1 Unit of Measurement: each.

.2 Method of Measurement: Measurement to be per the number of supplied and installed flow control valves, as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the flow control valve as shown on the Drawings, including reconfiguration of existing infrastructure in the pumphouse as necessary.

.6 Unit Price Item 6 – Supply and installation of variable frequency drive – Allen Bradley PowerFlex 523 and new cabinet – Type 3R ventilated c/w hinged doors (or approved alternatives)

.1 Unit of Measurement: each.

.2 Method of Measurement: Measurement to be per the number of supplied and installed variable frequency drives (incl. cabinet), as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the variable frequency drive and cabinet as shown on the Drawings, including reconfiguration of existing infrastructure inside the cabinet as necessary.

.7 Lump Sum Price Item 7 – Building interior electrical modifications

.1 Unit of Measurement: lump sum.

.2 Method of Measurement: Measurement to be lump sum for electrical upgrades and modifications required inside the existing pumphouse, as indicated on the Drawings accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the following:

.4 27 mm EMT raceway from existing 208/120V panel to new underground conduits.

.5 27 mm EMT raceway from existing control panel to new underground conduits.

.6 15A, 3P breaker in existing 208/120V panel for new well #2 pump.

.7 New load reactor.

.8 Junction box for conduit and feeder transition at exterior wall (power and control).

.8 Unit Price Item 8 – Supply and installation of electrical conduits and feeders

.1 Unit of Measurement: lineal meters (m).

.2 Method of Measurement: Measurement to be lineal meters along the length of the installed electrical conduits and feeders, as indicated on the Drawings and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials (including all necessary excavation, bedding, compaction and backfill) required to supply and install the following:

.4 Direct buried 53 mm rigid conduit.

.5 53 mm expoxy-coated RGS conduit transition from underground to above ground.

.6 Wall penetrations to underground feeds (LB fittings).

.7 Power feeds to new well pump: 3x #8AWG and #10 bond.

.8 Communication wiring from VFD to new well pump (4 pair #18 unshielded).

.9 Communication wiring from VFD to new well pump (1 pair #18 unshielded).

.10 Disconnect switch: 30A, 3P type 4X).

.11 Power feed from disconnect: 3x #8AWG and #10 bond.

.12 Connection to new well pump.

.9 Lump Sum Price Item 9 – Clearing and grubbing

.1 Unit of Measurement: lump sum.

.2 Method of Measurement: Measurement to be lump sum for all clearing and grubbing required to prepare areas for excavation, as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the vents including drainage gravel and filter fabric.

.10 Lump Sum Price Item 10 – Reinstate excavated areas with topsoil and seed

.1 Unit of Measurement: lump sum.

.2 Method of Measurement: Measurement to be lump sum for all disturbed areas, that require restoration due to construction impact with topsoil, and as accepted by the Departmental Representative.

.3 Payment to include the hauling, placement and grading of topsoil and the completion of hydroseeding, including hydroseed mix, erosion control agent, water and fertilizer as specified and maintenance.

.3 S-PLJ-FA Storm and Sanitary System Upgrades:

.1 Unit Price Item 11 – 600mm corrugated HDPE catch basin with cast iron grate. Soleno or approved alternate.

.1 Unit of Measurement: each

.2 Method of Measurement: Measurement to be based on units installed of each dimension, and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the complete catch basin, and shall include all excavation, bedding, compaction and backfill necessary for the complete installation.

.2 Unit Price Item 12 – Infiltration chambers. Soleno Hydrostor, or approved alternate.

.1 Unit of Measurement: each

.2 Method of Measurement: Measurement to be based on units installed of each type, and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the infiltration chambers, including chambers, end caps, geogrid and geotextile, and shall include all excavation, bedding, compaction and backfill necessary for the complete installation.

.3 Unit Price Item 13 – 200 mm HDPE Excavated Storm Sewer

.1 Unit of Measurement: lineal metre.

.2 Method of Measurement: Measurement to be lineal meters along the centerline of the installed storm sewer, and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the storm sewer, and shall include all excavation, bedding, connections to existing system, compaction, backfill and testing necessary for the complete installation.

.4 Lump Sum Price Item 14 – Removal of existing infrastructure

.1 Unit of Measurement: lump sum.

.2 Method of Measurement: Measurement to be lump sum for all removal of existing infrastructure as indicated on the Drawings and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to complete the following:

.1 Relocation of existing communications line.

.2 Removal of existing 1,200 mm dia. storm pumping station (incl. pumps).

.3 Removal of existing electrical service from storm pumping station to Visitors Centre.

.4 Removal of approximately 18 m of storm sewer as indicated on the Drawings.

.5 Decommissioning of storm line in place (including watertight plug) as indicated on the Drawings.

.6 Removal of existing 1,200 mm dia. sanitary pumping station (incl. pumps).

.7 Removal of existing electrical lines from sanitary pumping station to Visitors Centre.

.8 Proper disposal of all items removed from site.

.5 Unit Price Item 15 – Vegetated swale

.1 Unit of Measurement: lineal metre.

.2 Method of Measurement: Measurement to be lineal meters along the centerline of the completed swale, and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to construct the swale, and shall include all excavation, compaction, topsoil and reinstatement necessary for the complete installation.

.6 Unit Price Item 16 – 1500 mm diameter wet well sewage lift station

.1 Unit of Measurement: each.

.2 Method of Measurement: Measurement to be the number of installed wet wells as shown on the drawings and specified, and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the wet well pumping station and controls, including excavation, bedding, compaction and backfill, pre-cast concrete wet well, internal piping, pumps and control panel, lifting chain and davit, level control, frames and lockable covers, flow meter, forcemain between the wet well and valve chamber, check and plug valves, connection to existing piping and start up and commissioning. Existing rigid electrical conduit between lift station and Visitors Centre shall be protected and maintained, as indicated on Drawings.

.7 Lump Sum Price Item 17 – Electrical connection

.1 Unit of Measurement: lump sum.

.2 Method of Measurement: Measurement to be lump sum for electrical connection made between lift station pumps and control panel, as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required for the connection of electrical lines (power and communication) from lift station pumps to control panel as indicated on the Drawings, including running new electrical lines through existing rigid conduit to Visitors Centre.

.8 Unit Price Items 18 - Silt Control Fence

.1 Unit of Measurement: lineal meters (m).

.2 Method of Measurement: Measurement to be lineal meters along the centerline of the installed silt fence, and as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to install the silt fence structures as indicated on the Drawings, where required by the Specifications, or where directed by the Departmental Representative, as shown on the Drawings.

.9 Lump Sum Price Item 19 – Clearing and grubbing

.1 Unit of Measurement: lump sum.

.2 Method of Measurement: Measurement to be lump sum for all clearing and grubbing required to prepare areas for excavation, as accepted by the Departmental Representative.

.3 Payment to include all labour and materials required to supply and install the vents including drainage gravel and filter fabric.

.10 Lump Sum Price Item 20 – Reinstate excavated areas with topsoil and seed

.1 Unit of Measurement: lump sum.

.2 Method of Measurement: Measurement to be lump sum for all disturbed areas, that require restoration due to construction impact with topsoil, and as accepted by the Departmental Representative.

.3 Payment to include the hauling, placement and grading of topsoil and the completion of hydroseeding, including hydroseed mix, erosion control agent, water and fertilizer as specified and maintenance.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work.

### 1.2 ADMINISTRATIVE

.1 The Contractor shall schedule and administer project meetings throughout the progress of the work.

.2 The Contractor shall provide physical space and make arrangements for meetings at their site trailer.

.3 The Departmental Representative will record the meeting minutes and include significant proceedings and decisions and identify actions by parties.

.4 The Departmental Representative will reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and affected parties not in attendance.

.5 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

### 1.3 PRECONSTRUCTION MEETING

.1 Upon issuance of "Issued for Construction" drawings, the Contractor shall arrange a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Representatives of the Owner, Departmental Representative, Contractor, Subcontractors, field inspectors and supervisors should be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work.

.3 Schedule of submission of shop drawings.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities and fences (if deemed required).

.5 Delivery schedule of specified equipment.

.6 Site security.

.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime and administrative requirements.

.8 Monthly progress claims, administrative procedures, photographs, and hold backs.

.9 Appointment of inspection and testing agencies or firms.

.10 Insurances, transcript of policies.

**1.4 PROGRESS MEETINGS**

.1 During course of Work the Contractor shall schedule weekly progress meetings.

.2 Contractor, Subcontractors, Owner and Departmental Representative are to be in attendance.

.3 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.

.12 Other business.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work.

.2 Section 01 33 00 – Submittal Procedures.

### 1.2 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by the Department Representative to enable monitoring of project work in relation to established milestones.

### 1.3 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

## 1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit to the Departmental Representative within 5 working days of Award of Contract, Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Provide schedule in PDF format.

## 1.5 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

## 1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule.

.2 Ensure detailed Project Schedule includes as a minimum, milestone and activity types as follows:

.1 Award.

.2 Shop drawings and submittals.

.3 Permits.

.4 Mobilization/demobilization.

.5 Construction activities.

.6 Testing (as required).

## 1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

## 1.8 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

**Part 2 Products**

**2.1 NOT USED**

.1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 45 00 – Quality Control.

.2 Section 01 78 00 – Closeout Submittals.

### 1.2 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings and product data in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.10 Keep one reviewed copy of each submission on site.

### 1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Prince Edward Island, Canada as required.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which

adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 5 days for Departmental Representative's review of each submission.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, in electronic PDF format, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions shall include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.11 Submit electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.14 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.15 Submit electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Delete information not applicable to project.

.17 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copy will be returned, and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

## Part 2 Products

### 2.1 NOT USED

.1 Not Used.

## Part 3 Execution

### 3.1 NOT USED

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

.2 Province of Prince Edward Island

.1 Occupational Health and Safety Act - Updated 2015.

### 1.2 DEFINITIONS

.1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

.2 Competent Person means a person to who is:

.1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace.

.2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work.

.3 Knowledgeable about potential or actual danger to health or safety associated with the Work.

.3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.

.4 PPE: personal protective equipment.

.5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Health and Safety Plan prior to commencement of Work:

.1 Submit within ten (10) work days of notification of Bid Acceptance. Provide three (3) hard copies and one (1) electronic PDF file.

.2 Departmental Representative will review Health and Safety Plan and provide comments.

.3 Revise the Plan as appropriate and resubmit within five (5) work days after receipt of comments.

.4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall responsibility for Occupational Health and Safety of the Work.

.5 Submit revision and updates made to the Plan during the course of Work.

.3 Submit name of designated Health & Safety Site Representative and support documentation specified in the Safety Plan.

.4 Submit compliance certificates and other permits obtained.

.5 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other department of labour organization:

.1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.

.6 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.7 Submit copies of incident reports.

.8 Submit WHMIS MSDS - Material Safety Data Sheets.

## 1.4 COMPLIANCE REQUIREMENTS

.1 Comply with the Occupational Health and Safety Act for the Province of Prince Edward Island, and the Regulations made pursuant to the Act.

.2 Comply with Canada Labour Code Part II, and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.

.3 Observe and enforce construction safety measures required by:

.1 National Building Code of Canada (most recent version), Part 8.

.2 Provincial Worker's Compensation Board.

.3 Municipal statutes and ordinances.

.4 Comply with Occupational R.S.Q., c. S-2.1, an Act respecting Health and Safety Code for the Construction Industry.

.4 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

.5 A copy of the Canada Labour Code Part II may be obtained by contacting:

Government of Canada Publications
Publishing and Depository Services Directorate
Ottawa, Ontario K1A 0S5
Tel: (613) 941-5995 (1-800-635-7943)
Publication No. L31-85/2000 E or F

.6 Observe construction safety measures of:

.1 Part 8 of National Building Code.

.2 Municipal by-laws and ordinances.

.7 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.

.8 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.

.9 Medical Surveillance: Where prescribed by legislation or regulation, obtain and maintain worker medical surveillance documentation.

.10 Contractor shall submit proof of health and safety qualifications of all workers as requested.

.11 Contractor shall have a spill kit on site at all times during the Work.

## 1.5 SITE CONTROL AND ACCESS

.1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons:

.1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.

.2 Isolate Work Site from other areas of the premises by use of appropriate means:

.1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment.

.2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.

.3 Use professionally made signs with bilingual message in the two (2) official languages or international known graphic symbols.

.3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.

.4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.

.5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm.

## 1.6 PROTECTION

.1 Give precedence to safety and health of persons and protection of environment over cost and schedule considerations for Work.

.2 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

**1.7 RESPONSIBILITY**

.1 Be responsible for safety of persons and property on work site and for protection of employees and general public circulating adjacent to work operations to extent that they may be affected by conduct of work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

**1.8 PERMITS**

.1 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.

.2 Contractor to obtain Park Permit from the Parks Canada – Prince Edward Island Field Unit for each vehicle that will require access to the Park.

.3 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain Departmental Representative's approval to proceed prior to carrying out that portion of work.

.4 Post all permits on site. Submit copies to Departmental Representative.

**1.9 SAFETY ASSESSMENTS**

.1 Implement and carry out a health and safety hazard assessment program as part of the work. Program to include:

.1 Initial hazard assessment carried out immediately upon notification of contract award and prior to commencement of work.

.2 On-going hazard assessments performed during the progress of work identifying new or potential health risks and safety hazards not previously known. As a minimum, hazard assessments shall be carried out when:

.1 New subtrade work, new subcontractor(s) or new workers arrive at the site to commence another portion of the work.

.2 The scope of work has been changed by Change Order.

.3 Potential hazard or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety representative.

.3 Hazard assessments to be project and site specific, based on review of contract documents, site and weather conditions.

.4 Each hazard assessment to be made in writing. Keep copies of all assessments on site for duration of work. Upon request, make available to Departmental Representative for inspection.

## 1.10 PROJECT/SITE CONDITIONS

.1 The following are known or potential project related safety hazards at site:

.1 Work around highway traffic and pedestrians.

.2 Other construction contractors work on site.

.2 Above lists shall not be construed as being complete and inclusive of safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

## 1.11 SAFETY MEETINGS

.1 Prior to commencement of work attend health and safety meeting conducted by Departmental Representative. Have Contractor's Site Superintendent in attendance. Departmental Representative will advise of time and location.

.2 Provide site safety orientation session to all workers and other authorized persons prior to granting them access to work site. Brief persons on site conditions and on the minimum site safety rules in force at site.

.3 Conduct site specific occupational health and safety meetings during the entire work as follows:

.1 Formal meetings on a minimum monthly basis.

.2 Informal tool box meetings on a regular basis from a predetermined schedule.

.4 Keep workers informed of anticipated hazards, on safety practices and procedures to be followed and of other pertinent safety information related to:

.1 Progress of Work.

.2 New sub-trades arriving on site.

.3 Changes in site and project conditions.

.5 Record and post minutes of meetings. Make copies available to Departmental Representative upon request.

## 1.12 HEALTH AND SAFETY PLAN

.1 Develop written site-specific Project Health and Safety Plan, based on hazard assessments, prior to commencement of work. Submit plan to Departmental Representative within 7 calendar days of Contract Award date.

.2 Health and Safety Plan shall contain the following three (3) parts:

.1 Part 1: List of individual health risks and safety hazards identified by hazard assessments.

.2 Part 2: List of specific measures to control or mitigate each hazard and risk identified in part one of Plan. Describe the engineering controls, personnel protective equipment and safe work practises to be implemented and followed when performing work related to each identified hazard or risk.

.3 Part 3: Emergency Measures and Communications Procedures as follows:

.1 Emergency Measures: on-site operating procedures, evacuation measures and emergency response to be implemented in the occurrence of an incident. Procedures to be specific and relevant to identified hazards. Measures to complement and be integrated with the facility and tenants Emergency Response Plans in place at site:

.1 Obtain information on existing emergency and evacuation plans from Departmental Representative and incorporate appropriate data.

.2 Communication Procedures:

.1 List of names and telephone numbers of designated officials, to be contacted should an incident or emergency situation occur, including the following:

.1 General Contractor and all Subcontractors.

.2 Federal and Provincial Departments and local emergency resources organizations, as resources organizations, as applicable laws and regulations.

.3 Officials from Parks Canada. Departmental Representative will provide list of names to be included.

.2 Procedures implemented at site to communicate and share information between workers, subcontractors, and General Contractor on work activities.

.3 Prepare Health and Safety Plan in a three-column format, addressing the three parts specified above, as follows:

| Column 1 | Column 2 | Column 3 |
|---|---|---|
| Identified | Control | Emergency Measures and Communications |
| Hazard | Measures | Implemented Procedures |

.4 Develop Health and Safety Plan in collaboration with all subcontractors. Address all work and activities of subcontractors as they arrive on site. Immediately update Plan and submit to Departmental Representative.

.5 Implement, maintain and enforce compliance with requirements of the Health and Safety Plan until final completion of work and demobilization from site.

.6 As work progresses, review and update Plan addressing additional health risks and safety hazards identified by on-going hazard assessments.

.7 Submit revised versions of Plan to Departmental Representative.

.8 Post a typed written copy, including all updates, of the Health and Safety Plan in a common visible location at work site.

.9 Submission of the Health and Safety Plan, and updates, to the Departmental Representative is for review and information purposes only. Its submission shall not be construed to imply approval by Departmental Representative, be interpreted as a warranty of being complete, accurate and legislative compliant and shall not relieve Contractor of his legal obligations for the provision Health and Safety on the construction project.

## 1.13 SAFETY SUPERVISION AND INSPECTIONS

.1 Contractor shall have qualified Health & Safety Site Representative on site for daily supervision of health and safety of the Work.

.2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and will be assigned the responsibility and authority to:

.1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work.

.2 Monitor and enforce Contractor's site-specific Health and Safety Plan.

.3 Conduct site safety orientation session to persons granted access to Work Site.

.4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.

.5 Stop the Work as deemed necessary for reasons of health and safety.

.3 Health & Safety Site Representative must:

.1 Be qualified and competent person in occupational health and safety.

.2 Have site-related working experience specific to activities of the Work.

.3 Be on Work Site at all times during execution of the Work.

.4 All supervisory personnel assigned to the Work must also be competent persons.

.5 Inspections:

.1 Conduct regularly scheduled safety inspections of the Work on a minimum weekly basis. Record deficiencies and remedial action taken.

.2 Conduct Formal Inspections on a minimum monthly basis. Use standardized safety inspection forms. Distribute to subcontractors.

.3 Follow-up and ensure corrective measures are taken.

.6 Cooperate with Facility's Occupational Health and Safety representative should one be designated by Departmental Representative.

.7 Keep inspection reports and supervision related documentation on site.

**1.14 TRAINING**

.1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.

.2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.

.3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

**1.15 MINIMUM SITE SAFETY RULES**

.1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements at the work site and obeyed by all persons granted access:

.1 Wear personnel protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety footwear, high-visibility safety vest, and eye protection where appropriate.

.2 Immediately report unsafe activities, conditions, near-miss accidents, injuries and damages.

.3 Maintain site in tidy condition.

.4 Obey warning signs and safety tags.

.2 Brief workers on site safety rules, and on the disciplinary measures to be taken for violation or non-compliance of such rules. Post such information on site.

**1.16 CORRECTION OF NON-COMPLIANCE**

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

**1.17 INCIDENT REPORTING**

.1 Investigate and report incidents and accidents as outlined in Provincial Occupational Safety and Health Act and Regulations.

.2 Investigate and immediately report to Departmental Representative incidents and accidents which results, or has the potential of resulting in:

.1 Injuries requiring medical aid.

.2 Property damage in excess of $10,000.00.

.3 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.

.3 Medical aid in above clause shall have the same meaning as the term "medical aid injury" as defined in the Canadian Dictionary of Safety Terms - 1987 issue, from the Canadian Society of Safety Engineers (C.S.S.E) as follows:

.1 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.

.4 Submit report in writing.

## 1.18 TOOLS AND EQUIPMENT SAFETY

.1 Implement and follow a scheduled tool and equipment inspection / maintenance program at work site. Regularly check tools, equipment and machinery for safe operation and perform maintenance at pre-established time and frequency intervals as recommended by manufacturer. Include subcontractors' equipment as part of the inspection process.

.2 Use standardized checklists to ensure established safety checks are stringently followed.

.3 Immediately tag and remove items found faulty or defective off site.

.4 Maintain written documentation on each inspection. Make available to Departmental Representative upon request.

## 1.19 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information Systems (WHMIS).

.2 Keep MSDS data sheets on site. Provide copies of all data sheets to Departmental Representative upon receipt of materials on site.

.3 Post all MSDS data sheets on site, in a common area, visible to workers.

.4 On building renovation projects where work is adjacent to occupied areas, locate data sheets in a public location accessible to tenant employees.

## 1.20 BLASTING

.1 Blasting or other use of explosives is not permitted without prior written instructions from Departmental Representative.

## 1.21 POWDER ACTUATED DEVICES

.1 Use powder actuated fastening devices only after receipt of written permission from Departmental Representative.

## 1.22 POSTING OF DOCUMENTS

.1 Post documents indicated herein and as required by Authority having jurisdiction.

.2 Post other documents as specified herein, including:

.1 Site specific Health and Safety Plan.

.2 WHMIS data sheets.

**1.23 RECORDS ON SITE**

.1 Maintain on site copy of safety documentation as specified in this section and other safety related reports and documents issued to or received from authorities having jurisdiction.

.2 Make available to Departmental Representative, or authorized safety representative, for inspection upon request.

**1.24 BIRDS AND WILDLIFE**

.1 Any food or waste that could attract birds or wildlife can only be discarded in properly sealed waste containers.

**1.25 RADIO COMMUNICATIONS**

.1 When radio communication is required between the Contractor's personnel, all radio equipment shall be supplied by the Contractor.

**Part 2 Products**

**2.1 NOT USED**

.1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 - Cleaning.

.2 Section 01 74 19 - Waste Management and Disposal.

### 1.2 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

.3 Departmental Environmental Officer: Parks Canada employee responsible for environmental protection for all Work.

.4 Canada National Parks Act: federal law that regulates protection of natural areas of national significance. Development may only take place as authorized by Parks Canada, and all Work must adhere to the provisions of this Act.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for chemicals and filter media associated with the on-site water treatment system.

.2 Submit 2 copies of WHMIS Safety Data Sheets (SDS).

.3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.

.4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.5 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.6 Include in Environmental Protection Plan:

.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.

.3 Names and qualifications of persons responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.8 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.9 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.10 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

.11 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.12 Waste Water Management Plan identifying methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.13 Historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction. Plan shall include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

.7 Prior to commencing construction, the contractor, their employees and sub-contractors must meet with the Departmental Environmental Officer for a tailgate meeting on the environmental requirements for the project.

.8 If cultural resources (ex. archaeological resources) are discovered, immediately cease work, and alert Departmental Environmental Officer.

.9 The contract should adhere to all applicable Best Management Practices (BMPs) throughout duration of the Work (see Appendix A).

**1.4 FIRES**

.1 Fires and burning of rubbish on site is not permitted.

**1.5 DRAINAGE**

.1 Develop and submit Erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.

.3 Provide temporary drainage and pumping required to keep excavations and site free from water.

.4 Ensure pumped water into waterways, sewer or drainage systems is clean and sediment-free.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.6 SITE CLEARING AND PLANT PROTECTION**

.1 Trees and shrubs are not to be cut or limbed unless approved by Departmental Environmental Officer. Remove only trees that have been approved by Departmental Environmental Officer.

.2 Protect trees and plants on site and adjacent properties as indicated.

.3 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes.

.4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.5 Minimize stripping of topsoil and vegetation.

**1.7 POLLUTION CONTROL**

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Cover or wet down dry materials to prevent blowing dust.

.4 Construction wastes must be stored in a tarp covered waste bin to prevent light materials from blowing out of the dumpster.

.5 Food wastes must be stored in a covered metal container to prevent access by wildlife. Feeding of wildlife is strictly prohibited. This is a violation of the National Parks Wildlife Regulations and the offending individual(s) can be charged, fined and removed from the work site.

**1.8 NOTIFICATION**

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

**Part 2 Products**

**2.1 PARKS CANADA SEED MIXTURE**

- 60% Creeping Red Fescue
- 20% Hard Fescue
- 10% Perennial Rye Grass
- 10% Alsike Clover

**Part 3 Execution**

**3.1 CLEANING**

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Absolutely no burying of rubbish or waste materials on site.

.3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

.5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

### 1.2 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

### 1.3 TESTING AGENCIES

.1 An Inspection/Testing Agency will be engaged by the Departmental Representative for the purpose of inspecting and/or testing portions of Work.

.2 Employment of inspection/testing agencies does not relax responsibility of contractor to perform Work in accordance with Contract Documents.

.3 If defects are revealed during inspection and/or testing, agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Owner. Pay for costs of re-testing and re-inspection.

### 1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

### 1.5 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle materials on site. Provide sufficient space to store and cure test samples.

**1.6 REJECTED WORK**

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in the opinion of the Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance to the Contract Documents, the Owner will deduct from the Contract Price the difference in value between the Work performed and that called for by the Contract Documents, the amount which will be determined by the Engineer.

**1.7 REPORTS**

.1 Submit electronic PDF copies of inspection and test reports to Departmental Representative for review.

**1.8 TESTS AND MIX DESIGNS**

.1 Furnish test results and mix designs as requested.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 51 00 – Temporary Utilities.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

### 1.3 INSTALLATION AND REMOVAL

.1 Identify areas which have to be gravelled to prevent tracking of mud.

.2 Indicate use of supplemental or other staging area.

.3 Provide construction facilities in order to execute work expeditiously.

.4 Remove from site all such work after use.

### 1.4 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs as required.

### 1.5 HOISTING

.1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment.

.2 Hoists and cranes to be operated by qualified operator.

### 1.6 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

### 1.7 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

### 1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

**1.9 PROTECTION AND MAINTENANCE OF TRAFFIC**

.1 Provide measures for protection and diversion of traffic, including erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs to close off the Work site.

.2 Protect travelling public from damage to person and property.

.3 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.4 Verify adequacy of existing roads and allowable load limit on these roads. Contractor is responsible for repair of damage to roads caused by construction operations.

.5 Dust control: adequate to ensure safe operation at all times.

.6 Remove, upon completion of work, haul roads designated by Departmental Representative.

**1.10 FIRE ROUTES**

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.11 CLEAN-UP**

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 77 00 – Closeout Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

### 1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Dispose of waste materials and debris at approved facilities.

.6 Clean interior areas prior to start of finishing work and maintain areas free of dust and other contaminants during finishing operations.

.7 Store volatile waste in covered metal containers and remove from premises at end of each working day.

.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly constructed surfaces.

### 1.3 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.8 Remove dirt and other disfiguration from exterior surfaces.

.9 Sweep and wash clean paved areas.

.10 Clean equipment and fixtures to sanitary condition.

.11 Clean roofs, downspouts, and drainage systems.

.12 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

.1 Separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 - Cleaning

### 1.2 REFERENCES

.1 Definitions:

.1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority.

.2 Approved disposal area: Disposal area as designated by the Owner.

.3 Class III: non-hazardous waste - construction renovation and demolition waste.

.4 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities.

.5 Inert Fill: inert waste - exclusively asphalt and concrete.

.6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.10 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.11 Separate Condition: refers to waste sorted into individual types.

.12 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prepare and submit on monthly basis, throughout project or at intervals agreed to by Departmental Representative the following:

.1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.

.2 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.

.3 Submit prior to final payment the following:

.1 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

## 1.4 USE OF SITE AND FACILITIES

.1 Execute Work with minimal interference and disturbance to normal use of premises.

.2 Maintain security measures established by facility provide temporary security measures approved by Departmental Representative.

## 1.5 WASTE PROCESSING SITES

.1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

## 1.6 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations so as to not interfere with Work.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to designated disposal facility.

.5 Protect structural components not removed and salvaged materials from movement or damage.

.6 Protect surface drainage, mechanical and electrical from damage and blockage.

.7 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.

.8 Separate and store materials produced during project in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

.4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

**1.7 DISPOSAL OF WASTES**

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste type into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

**1.8 SCHEDULING**

.1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 APPLICATION**

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**3.2 CLEANING**

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 78 00 – Closeout Submittals.

### 1.2 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request Departmental Representative's inspection.

.2 Departmental Representative's Inspection:

.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in 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, adjusted, balanced and fully operational.

.4 Operation of systems: demonstrated to Owner's personnel.

.5 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.

.2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when Departmental Representative 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 Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

.2 When Work is deemed incomplete by Departmental Representative, 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.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 77 00 – Closeout Procedures.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

### 1.3 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 Arrange content by systems under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide CAD files in .dwg format on CD or memory stick.

.10 Provide PDF format of Binders, one volume per PDF file, bookmark each separate product and system with description of product and major component parts of equipment.

### 1.4 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 Departmental Representative 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.

## 1.5 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Departmental Representative one 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 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.

.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 and samples available for inspection by Departmental Representative.

## 1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line drawings, and in copy of Project Manual.

.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 Record information in AutoCAD .dwg files.

.5 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 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.6 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.

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

.8 Provide digital photos, if requested, for site records.

## 1.7 FINAL SURVEY

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

.1 Prepare a complete in-trench survey for all utilities.

.2 Prepare a complete as-built topographical survey to capture all surface features.

.2 Locate all roadways, pads, buildings, trees, shrubs, flag poles, bollards, posts, abandoned utilities, capped utilities and new utilities within the construction area.

.3 Locate sewer manholes, water valve chambers and catchbasins c/w inverts indicated by north, south, east, west location.

.4 Locate electrical manholes, poles, transformers, switching cubicles and specialty lights.

.5 Provide survey on CD or memory stick in AutoCAD .dwg format along with .csv or ASCII file of raw data points.

## 1.8 WARRANTIES AND BONDS

.1 Submit all information relevant to warranties to Departmental Representative as per Section 01 33 00 – Submittal Procedures.

.2 Warranty submittals to include required actions and documents to assure that Owner receives warranties to which it is entitled.

.3 Warranty submittals shall be prepared in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.4 Assemble approved warranty submittals in binder, submit upon acceptance of work and organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.5 Respond in timely manner to oral or written notification of required construction warranty repair work.

.6 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Owner to proceed with action against Contractor.

**1.9 DELIVERY SCHEDULE**

.1 Accompany Record Information submissions with a transmittal containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Other pertinent data.

.2 Within three weeks of substantial completion, or as otherwise agreed, the Contractor shall deliver the Record Information package with the data required as identified herein.

.1 Allow ten working days for the Departmental Representative's or Owner's review of each submission.

## Part 2 Products

**2.1 NOT USED**

.1 Not Used.

## Part 3 Execution

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 SECTION INCLUDES

.1 Commissioning, testing and documentation.

.2 Audit testing and the commissioning auditor.

### 1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

### 1.3 DEFINITIONS

.1 Commissioning: The process for achieving, verifying, and documenting that the facility and its systems are planned, designed, installed, and tested to ensure that they meet the original project requirements established by the Owner.

.2 Commissioning Team:

.1 Departmental Representative: Representative of the Owner, as defined in the Agreement.

.2 Contractor Representatives: Representatives of the Contractor, including any sub-contractors whose scope of work includes items requiring commissioning.

.3 Testing Agency: Specialty agency engaged by the Owner to perform tests on components or systems to verify conformance to Owner's requirements or specified requirements.

.3 Commissioning Documents:

.1 Commissioning Plan: A project-specific document which defines the scope and approach to commissioning of this facility.

.2 Submittal: Contract submittal, as specified in Contract Documents.

.3 Static check certificate: A document used to verify equipment data actually installed, prior to startup or operation.

.4 Operating check certificate. A document used to verify equipment operation, including performance statistics.

.5 Startup Reports: Report prepared by equipment startup personnel, including start-up sequence, and performance statistics.

.6 Balancing Report: Report prepared by the balancing agency, indicating initial and final system performance.

.7 Maintenance Manual: A document containing detailed descriptions and technical information about start-up, operation and maintenance of equipment.

## 1.4 WORK SUMMARY

.1 Brackley Well Commissioning

.1 As part of Brackley Well #2 Commissioning work, all motors, VFDs, instruments and controls are to be connected, programmed and proven to operate as per the design intent to the satisfaction of the Departmental Representative.

.2 New well pump #2 control is to be the same as controls for existing well pump #1, with normal well pump normal signalled by liquid level in the reservoir. Well pump #1 and well pump #2 to operate in alternating sequence under normal operating conditions.

.3 For integration of Well #2 into the water treatment and distribution system, the Contractor shall use A&T Automation, contact Aaron Thomson at 902-894-7447 for PLC programming and controls.

## 1.5 METHODOLOGY

.1 The Contractor shall develop a Commissioning Plan, including as a minimum the management of commissioning meetings, and the management of project-specific commissioning documents.

.2 Commissioning Plan to include:

.1 Assembly of owner's requirements, including design criteria, performance goals, budgets, and schedules.

.2 Scheduling and chairing of commissioning meetings between team members.

.3 Development of static and operating check certificates for individual equipment.

.4 Assembly of commissioning reports, including testing and balancing reports, maintenance manuals, startup reports, and testing reports.

.5 Verification of data by testing agency.

.6 Audit procedure, to be performed in the event of dispute or failure.

.3 Execute the commissioning plan.

## 1.6 REGULATORY REQUIREMENTS

.1 Arrange for regulatory authorities to witness those commissioning start up procedures which are also required by regulatory authorities.

.2 Obtain certificates of approval and for compliance with regulations from Authorities Having Jurisdiction; include copies of certificates with start up reports.

## 1.7 CONTRACT COMMISSIONING REQUIREMENTS

.1 Witnessing: Allow commissioning team members to witness starting, testing, adjusting, and balancing procedures.

.2 Costs: Pay costs associated with starting, testing, adjusting, and relevant instruments and supplies required to perform those duties.

.3 Employ experienced personnel for equipment startup and commissioning, who are able to interpret results of readings and tests and report the system status in a clear and concise manner.

.4 Provide all equipment required to perform testing, balancing, and commissioning of systems. Calibrate instruments used in start up as accurate; provide calibration certificates if requested by the Commissioning Manager.

.5 Utilize equipment check certificates and other commissioning documents required by the Commissioning Manager.

.6 Verify that equipment is installed in accordance with Contract Documents, and reviewed shop drawings. Sign and date static check certificates.

.7 Do not start up equipment unless static check sheets have been completed and submitted.

.8 Complete in detail and sign operating check certificates.

# Part 2 Products

## 2.1 NOT USED

.1 Not Used.

# Part 3 Execution

## 3.1 COMMISSION TESTING

.1 Allow for work, effort, and associated costs necessary to assist the Departmental Representative, for fulfilment of a commission testing process of the facility and Work.

.2 Coordinate, cooperate, and harmonize efforts with the Departmental Representative.

.3 Commission testing will include a random testing and evaluation process as determined by the Departmental Representative.

.4 System and device checks to be suitably logged, tabulated, signed, and incorporated into project Operating and Maintenance Manuals:

.1 Prior to start of testing, provide two (2) complete sets of up-to-date contract drawings and specifications including addenda to the Commissioning Manager.

.2 Provide one (1) copy of each approved notice of change and clarification.

.3 Coordinate site visits by the Departmental Representative and the affected parties during warranty periods.

.5 The commissioning process will not:

.1 Preclude the duties and responsibilities described in the Contract Documents nor the requirements and obligations of the Contract.

.2 Circumvent any required warranties.

.3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.

.6 Prior to commission testing, perform the following and provide copies to the Departmental Representative, of component and assembly Contract Document compliance:

.1 Equipment operating certificates.

.2 Inspection certificates from authorities having jurisdiction.

.3 Required copies of shop drawings.

.4 Manufacturer's operating and maintenance brochures of all major equipment.

.7 Ensure all systems have been started, adjusted to design criteria, and are functionally operational, ready for independent testing.

.8 Cooperate with the Departmental Representative in advance of activating operating systems.

.9 Test results that reveal failure to conform to the Contract Documents, will result in the Owner arranging and paying to correct the Work at the Owner's discretion, and recovering all associated costs from the Contractor.

## 3.2 AUDIT TESTING AND THE COMMISSIONING AUDITOR

.1 In the event on non-compliance or test failure described in the commission testing process above, comply with the following requirements.

.2 Allow for work, effort, and associated costs necessary to assist an Owner appointed and remunerated Auditor, for fulfilment of a further audit testing of the facility and Work.

.3 Coordinate, cooperate, and harmonize efforts with the Auditor.

.4 Audit testing will include further random testing and evaluation as determined by the Auditor, and the Departmental Representative.

.5 Suitably log, tabulate, and incorporate signed system and device check certificates into Operating and Maintenance Manuals.

.6 Coordinate site visits by the Auditor, Departmental Representative and the affected parties during warranty periods.

.7 The audit process will not:

.1 Preclude the duties and responsibilities described in the Contract nor the requirements and obligations of the Contract.

.2 Circumvent any required warranties.

.3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.

.8 Cooperate with the Auditor prior to testing of operating systems.

.9 Test results that demonstrate failure to conform to the Contract Documents, may result in the following, at the Owner's sole discretion:

.1 Complete rejection of the subject component, assembly, or system.

.2 Removal of defective items from the Work.

.3 An adjustment credit to the Contract Price for the Owner's estimated value of the subject item plus remuneration for associated damages and inconvenience.

.4 Provision of a suitable substitute Product in place of the defective Product.

.5 Substituted Products will be required to be commissioned and audited and undergo the same scrutiny as described for commission testing and audit testing described above.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Division 1.

### 1.2 REFERENCES

.1 Definitions:

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

.2 Reference Standards:

.1 CSA Group

.1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings:

.1 Submit shop drawings stamped and signed by Contractor.

.2 If changes are required, notify Departmental Representative of these changes before they are made.

.4 Certificates:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment or material is not available, submit such equipment or material to authority having jurisdiction for approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit 600 x 600 mm minimum size drawings to authority having jurisdiction.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

## 1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

## 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect equipment and materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors,control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates for control items in English.

### 2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment are to be CSA certified. Where CSA certified material or equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

### 2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit: As indicated on drawings.

### 2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction and Departmental Representative.

.2 Porcelain enamel signs, minimum size 175 x 250 mm.

### 2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

### 2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid 3 mm melamine, black face, white core, lettering accurately aligned and engraved into core.

.2 Sizes as follows:

| NAMEPLATE SIZES | | | |
|---|---|---|---|
| Size 1 | 10 x 50 mm | 1 line | 3 mm high letters |
| Size 2 | 12 x 70 mm | 1 line | 5 mm high letters |
| Size 3 | 12 x 70 mm | 2 lines | 3 mm high letters |
| Size 4 | 20 x 90 mm | 1 line | 8 mm high letters |
| Size 5 | 20 x 90 mm | 2 lines | 5 mm high letters |
| Size 6 | 25 x 100 mm | 1 line | 12 mm high letters |
| Size 7 | 25 x 100 mm | 2 lines | 6 mm high letters |

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

## 2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

## 2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

| System | Prime Colour | Auxiliary Colour |
|---|---|---|
| up to 250 V | Yellow | |
| Other Communication Systems | Green | Blue |

**2.9 FINISHES**

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light gray.

**Part 3 Execution**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 INSTALLATION**

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

**3.3 NAMEPLATES AND LABELS**

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

**3.4 CONDUIT AND CABLE INSTALLATION**

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

**3.5 MOUNTING HEIGHTS**

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

## 3.6 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

## 3.7 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Motors and associated control equipment including sequenced operation of systems where applicable.

.4 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Check resistance to ground before energizing.

.3 Carry out tests in presence of Departmental Representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

## 3.8 SYSTEM STARTUP

.1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation and ensure that operating personnel are conversant with aspects of its care and operation.

## 3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Division 1.

.2 Section 26 05 00 – Common Work Results for Electrical.

### 1.2 REFERENCES

.1 CSA International CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.

.1 CAN/CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

### 1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

### 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

## Part 3 Execution

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.

### 3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Division 1.

.2 Section 26 05 00 - Common Work Results for Electrical.

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.4 Section 33 65 76 - Direct Buried Underground Cable Ducts.

### 1.2 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

### 1.3 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.

## Part 3 Execution

### 3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

## 3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 In underground ducts in accordance with Section 33 65 76 - Direct Buried Underground Cable Ducts.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Division 1.

.2 Section 26 05 00 - Common Work Results for Electrical.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

### 1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

### 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect grounding equipment from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 EQUIPMENT

.1 Insulated grounding conductors: green, copper conductors, size as indicated.

## Part 3 Execution

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 INSTALLATION GENERAL

.1 Make grounding connections in radial configuration only. Avoid loop connections.

.2 Ground secondary service pedestals.

### 3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, frames of motors, starters, control panels.

### 3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

### 3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED SECTIONS

.1 Division 1.

.2 Section 26 05 00 - Common Work Results for Electrical.

### 1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted.

## Part 3 Execution

### 3.1 INSTALLATION

.1 Secure equipment to tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.4 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole malleable PVC coated straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole PVC coated straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.5 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.6 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.8 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.9 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED SECTIONS

.1 Division 1.

.2 Section 26 05 00 – Common Work Results for Electrical.

### 1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No. 18.1-2018, Metallic Outlet Boxes

.2 CAN/CSA C22.2 No. 18.3-12 (R2017), Conduit, Tubing and Fittings.

.3 CAN/CSA C22.2 No. 18.4-15, Hardware for the Support of Conduit, Tubing and Cable.

.4 CSA C22.2 No. 56-17, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.5 CSA C22.2 No. 83.1-07 (R2017), Electrical Metallic Tubing - Steel.

.6 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.

### 1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

.3 Quality assurance submittals:

.1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

### 1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 CONDUITS

.1 Rigid PVC conduit: to CSA C22.2 No. 211.2.

**2.2 CONDUIT FASTENINGS**

.1 One hole malleable iron straps to secure surface conduits 50 mm and smaller. PVC coated straps for PVC conduit.

.2 Two hole steel straps for conduits larger than 50 mm. PVC coated straps for PVC conduit.

.3 Beam clamps to secure conduits to exposed steel work.

**2.3 CONDUIT FITTINGS**

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

**2.4 EXPANSION FITTINGS FOR RIGID CONDUIT**

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

**2.5 FISH CORD**

.1 Polypropylene.

**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 datasheets.

**3.2 INSTALLATION**

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms.

.3 Use rigid PVC conduit unless indicated otherwise.

.4 Use rigid PVC conduit underground.

.5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.6 Minimum conduit size for lighting and power circuits: 21 mm.

.7 Install fish cord in empty conduits.

.8 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.9 Dry conduits out before installing wire.

## 3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels.

.5 Do not pass conduits through structural members except as indicated.

## 3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

## 3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

## 3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Division 1.

.2 Section 26 05 00 – Common Work Results for Electrical.

### 1.2 REFERENCES

.1 CSA International

.1 CAN/CSA-C22.2 No.47-13(R2018), Air-Cooled Transformers (Dry Type).

.2 CSA C9-02(R2007), Dry-Type Transformers.

.3 CAN/CSA-C802.2-18, Test Method and Minimum Efficiency Values for Dry-type Transformers.

.2 National Electrical Manufacturers Association (NEMA).

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for dry type transformers and include product characteristics, performance criteria, physical size, finish and limitations.

### 1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for dry type transformers for incorporation into manual.

### 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect dry type transformers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 DESIGN DESCRIPTION

.1 Performance Characteristics:

.1 Type: ANN.
.2 3 phase, 600V input, 208V output, 60 Hz.
.3 Voltage taps: standard.
.4 Basic Impulse Level (BIL): standard.
.5 Hipot: standard.
.6 Average sound level: standard
.7 Impedance at 17 degrees C: standard
.8 Enclosure: CSA, removable metal front panel.
.9 Mounting: as indicated.
.10 Finish: in accordance with Section 26 05 00 - Common Work Results for Electrical.
.11 Copper windings.
.12 Winding configuration to be as noted on drawings.
.13 Voltage Regulation to be 4% or better.

### 2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Label size: 7.

## Part 3 Execution

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for dry type transformers installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

## 3.2 INSTALLATION

.1 Mount dry type transformers as indicated.

.2 Ensure adequate clearance around transformer for ventilation in accordance with manufacturer's recommendations.

.3 Install transformers in level upright position.

.4 Remove shipping supports only after transformer is installed and just before putting into service.

.5 Loosen isolation pad bolts until no compression is visible.

.6 Make primary and secondary connections in accordance with wiring diagram.

.7 Energize transformers after installation is complete.

.8 Make conduit entry into bottom 1/3 of transformer enclosure.

## 3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

## 3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by dry type transformers installation.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Division 1.

.2 Section 26 05 00 – Common Work Results for Electrical.

### 1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5-16, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

### 1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Circuit breakers to have minimum symmetrical rms interrupting capacity rating equal to or greater than the panelboard in which they are to be installed.

.5 The use of tandem breakers is not allowed.

### 2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

### 2.3 OPTIONAL FEATURES

.1 Include:

.1 On-off locking device.

.2 Handle mechanism.

## Part 3 Execution

### 3.1 INSTALLATION

.1 Install circuit breakers as indicated.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Division 1.

.2 Section 26 05 00 – Common Work Results for Electrical.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Provide shop drawings for each type of starter to indicate:

.1 Mounting method and dimensions.

.2 Starter size and type.

.3 Layout and components.

.4 Enclosure types.

.5 Wiring diagram.

.6 Interconnection diagrams.

### 1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit operation and maintenance data for variable frequency drive for incorporation into maintenance manual.

### 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 VARIABLE FREQUENCY DRIVE

.1 Three phase Variable Frequency Drive with performance characteristics as follows:

- .1 Input Voltage: 208-230V, 3-phase.
- .2 Output Voltage: 208-230V, 3-phase.
- .3 Minimum horsepower output: 3 HP
- .4 Enclosure type: NEMA 1.
- .5 Additional features:
  - .1 Load reactor.
- .6 Standard of acceptance: Allen Bradley PowerFlex 523 or approved alternate.

### 2.2 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results for Electrical.

### 2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Variable Frequency Drive designation label, white plate, black letters.

## Part 3 Execution

### 3.1 INSTALLATION

.1 Install starters and control devices in accordance with manufacturer's instructions.

.2 Install and wire starters and controls as indicated.

.3 Ensure correct fuses installed.

.4 Confirm motor nameplate and adjust overload device to suit.

### 3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and manufacturer's instructions.

.2 Operate switches and contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

**3.3 CLEANING**

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 – Cleaning.

.2 Section 31 14 13 – Soil Stripping and Stockpiling.

### 1.2 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps, roots, boulders and rock fragments to not less than specified depth below existing ground surface.

### 1.3 SAFETY

.1 Safety Requirements: worker protection.

.1 Workers must wear gloves, long sleeved clothing, and eye protection when clearing and grubbing.

.2 Workers must not eat, drink or smoke while clearing or grubbing.

### 1.4 STORAGE AND PROTECTION

.1 Prevent damage to trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utilities, and other site appurtenances which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

### 1.5 WASTE MANAGEMENT

.1 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

.1 Stockpile adjacent to site.

## Part 2 Products

### 2.1 MATERIALS

.1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

.2 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reuse.

## Part 3 Execution

### 3.1 TEMPORARY EROSION AND SEDIMENT CONTROL

.1 Provide temporary erosion and sediment control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.2 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utilities: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utilities are encountered.

.2 When utilities which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing.

.4 Keep roads and walks free of dirt and debris.

### 3.3 CLEARING

.1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.

.2 Clear as directed by Departmental Representative by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Cut off branches overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

.5 Apply herbicide in accordance with manufacturer's label to top surface of stumps designated not to be removed.

**3.4 CLOSE CUT CLEARING**

.1 Close cut clearing to ground level to within 100 mm of ground surface.

.2 Perform close cut clearing by hand so that existing muskeg is not damaged.

.3 Cut off branches overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

**3.5 ISOLATED TREES**

.1 Cut off isolated trees as directed by Departmental Representative at height of not more than 300 mm above ground surface.

.2 Grub out isolated tree stumps.

.3 Prune individual trees as indicated.

.4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.

.5 Cut limbs and branches to be trimmed close to bole of tree or main branches.

.6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

**3.6 UNDERBRUSH CLEARING**

.1 Clear underbrush from areas as indicated to ground level.

**3.7 GRUBBING**

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 $m^3$.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform to existing adjacent surface of ground.

**3.8 REMOVAL AND DISPOSAL**

.1 Remove cleared and grubbed materials to disposal area designated by Departmental Representative.

.2 Cut timber greater than 125 mm diameter to 3600 mm lengths and stockpile. Stockpiled timber becomes property of Departmental Representative.

.3 Chip, mulch and spread cleared and grubbed vegetative material on site as directed by Departmental Representative.

.4 Remove diseased trees and dispose to approval of Departmental Representative.

**3.9 FINISHED SURFACE**

.1 Leave ground surface in condition suitable for stripping of topsoil to approval of Departmental Representative.

**3.10 CLEANING**

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 – Cleaning.

## Part 2 Products

### 2.1 NOT USED

.1 Not Used.

## Part 3 Execution

### 3.1 TEMPORARY EROSION AND SEDIMENT CONTROL

.1 Provide temporary erosion and sediment control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.2 STRIPPING OF TOPSOIL

.1 Ensure that procedures are conducted in accordance with applicable Provincial requirements.

.2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.3 Handle topsoil only when it is dry and warm.

.4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by composting.

.5 Remove brush from targeted area by non-chemical means and dispose of through mulching.

.6 Strip topsoil to depths as indicated.

.1 Avoid mixing topsoil with subsoil.

.7 Pile topsoil in berms in locations as directed by Departmental Representative.

.1 Stockpile height not to exceed 2.5 to 3 m.

.8 Dispose of unused topsoil in location as indicated by Departmental Representative.

.9 Protect stockpiles from contamination and compaction.

.10 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

## 3.3 PREPARATION OF GRADE

.1 Verify that grades are correct and notify Departmental Representative if discrepancies are present.

.1 Grade area only when soil is dry to lessen soil compaction.

.2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

## 3.4 PLACING OF TOPSOIL

.1 Place topsoil only after Departmental Representative has accepted subgrade.

.2 Spread topsoil during dry conditions in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.

.3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.

.4 Cultivate soil following spreading procedures.

## 3.5 SUB-SOILING

.1 Apply sub-soil, following spreading and cultivating procedures to designated areas to improve drainage and agricultural potential of soil.

.2 Work sub-soil area following natural grade contour lines, with vibrating sub-soiler to depth of 40 cm.

.3 Cross sub-soil the area following the first pass.

.4 Cultivate the soil with a chain harrow to de-clod the soil.

## 3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 31 14 13 – Soil Stripping and Stockpiling.

### 1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m$^3$).

.5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m$^3$).

.6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001-03, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 Prince Edward Island Department of Transportation, Infrastructure and Energy (PEITIE) Standard Specifications (most recent version):

.1 PEITIE Standard Specification Item 217 – Trench Excavation and Backfilling

.2 PEITIE Standard Specification Item 402 – Bedding Material

### 1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock : solid material in excess of 1.0 $m^3$ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 $m^3$ bucket. 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:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 mm in any dimension.

.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 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.7 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 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-8.2.

.2 Table:

| Sieve Size (mm) | % Passing |
|---|---|
| 2.00 | 100 |
| 0.10 | 45 - 100 |
| 0.02 | 10 - 80 |
| 0.005 | 0 - 45 |

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

.8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

## 1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.

.2 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.

.3 Submit to Departmental Representative written notice at least 7 days prior to excavation work.

.4 Submit to Departmental Representative written notice when bottom of excavation is reached.

.5 Submit to Departmental Representative testing results as described in PART 3 of this Section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

.2 Submit records of underground utility locates indicating: location plan of existing utilities as found in field and location plan of relocated and abandoned services, as required.

## 1.5 QUALITY ASSURANCE

.1 Submit design and supporting data at least 2 weeks prior to beginning Work.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional Engineer licensed in the Province of Prince Edward Island.

.3 Keep design and supporting data on site.

## 1.6 EXISTING CONDITIONS

.1 Examine soil report bound to this specification.

.2 Buried services:

.1 Contractor shall request from utility provider the locations and extents of existing service lines in area of work prior to starting work (submit report as submittal). Location of services shown on utilities plan is approximate only and not deemed accurate.

.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 beginning excavation Work, notify Departmental Representative and establish location and state of use of buried utilities and structures.

.6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be paid by Owner.

.8 Record location of maintained, re-routed and abandoned underground lines.

.9 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Conduct, with Departmental Representative a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks 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 as directed by Departmental Representative.

## 1.7 SHORING, BRACING AND UNDERPINNING

.1 Protect existing features in compliance with Section 01545 Safety Requirements and applicable local regulations.

.2 Engage services of qualified professional engineer who is registered or licensed in province of PEI, Canada in which work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for work.

.3 Submit design and supporting data at least (2) weeks prior to commencing work.

# Part 2 Products

## 2.1 MATERIALS

.1 Pipe Bedding/Surround: hard, granular, sharp material, well-graded from coarse to fine, free of impurities, chemicals or organic matter, graded as follows:

| Sieve Size | Percent Passing |
|---|---|
| 5 mm | 100 |
| 0.16 mm | 0 – 5 |

.2 Drainage stone (6 mm to 19 mm) shall be used as pipe bedding in wet trench conditions when deemed necessary by the Departmental Representative.

.3 Suitable excavated common (Backfill): Common material from site which is free of stumps, trees, roots, organics, boulders and masonry larger than 100 mm in any dimension and other deleterious materials as approved by the Departmental Representative.

.4 Granular Class A material shall be used as backfill only when suitable excavated common not available and must be approved by the Departmental Representative. Granular Class A material shall be in accordance with PEITIE specifications, as follows:

| Sieve Size | Percent Passing |
|---|---|
| 31.5 mm | 100 |
| 25.0 mm | 95 – 100 |
| 19.0 mm | – |
| 12.5 mm | 50 – 83 |
| 4.75 mm | 30 – 60 |
| 1.18 mm | 15 – 40 |
| 600 µm | 10 – 32 |
| 300 µm | 5 – 22 |
| 75 µm | 3 – 9 |

.5 Common Borrow shall be imported from an approved offsite location and shall meet the requirements of suitable excavated common material. Common borrow is to be used only under the approval the Departmental Representative in situations where suitable excavated common is not available.

.6 Marking Tape: Color coded heavy gauge polyethylene, 150 mm wide indicating the service type buried below.

.7 Geotextiles: to Section 31 32 19.01 - Geotextiles.

## Part 3 Execution

### 3.1 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 according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.2 SITE PREPARATION

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

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

### 3.3 PREPARATION/PROTECTION

.1 Keep excavations clean, free of standing water, and loose soil.

.2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.

.3 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.

.4 Protect buried services that are required to remain undisturbed.

## 3.4 STRIPPING OF TOPSOIL AND STOCKPILING

.1 Do topsoil stripping and stockpiling in accordance with Section 31 14 13 – Soil Stripping and Stockpiling.

## 3.5 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for Departmental Representative approval the details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.1 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 portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.6 Provide flocculation tanks, settling basins, geotubes or other treatment methods and facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

## 3.6 EXCAVATION

.1 Advise Departmental Representative at least 7 days in advance of excavation operations.

.2 Excavate to lines, grades, elevations and dimensions as indicated.

.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.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.5 For trench excavation, do not excavate more than 30 m of trench in advance of installation operations. All excavations shall be filled at end of work day prior to leaving site.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material in approved location.

.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 Departmental Representative when bottom of excavation is reached.

.12 Obtain Departmental Representative approval of completed excavation.

.13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.14 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with Granular Class D material compacted to not less than 100% of SPMDD.

.2 Fill under other areas with Granular Class D material compacted to not less than 95% of SPMDD.

.15 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

.16 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

## 3.7 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below.

.1 Exterior side of structure walls: use Granular Class D material to subgrade level. Compact to 95% of SPMDD.

.2 Under concrete slabs: use Granular Class D material to underside of base course for concrete slabs. Compact to 98% of SPMDD.

.3 Under concrete slabs: provide 150 mm compacted thickness base course of Granular Class A material to underside of slab. Compact base course to 98% SPMDD.

.4 Place unshrinkable fill in areas as indicated.

## 3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Hand place material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.2 Place bedding and surround material in unfrozen condition.

## 3.9 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

- .1 Departmental Representative has inspected and approved installations.
- .2 Departmental Representative has inspected and approved of construction below finish grade.
- .3 Inspection, testing, approval, and recording location of underground utilities.
- .4 Removal of concrete formwork.
- .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.5 Backfilling around installations:

- .1 Place bedding and surround material as specified elsewhere.
- .2 Do not backfill around or over cast-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 300 mm.

.6 Place unshrinkable fill in areas as indicated.

.7 Consolidate and level unshrinkable fill with internal vibrators.

## 3.10 TESTING

.1 Quality control testing of bedding, surround and backfill shall be carried out and paid for by the Contractor. Submit satisfactory compaction testing results to Departmental Representative for review and approval as results become available.

.2 Departmental Representative may conduct quality assurance testing at own cost to verify testing results of contractor.

.3 Contractor shall provide sample in advance for establishing SPMDD.

## 3.11 RESTORATION

.1 Replace topsoil as indicated.

.2 Reinstate lawns to elevation which existed before excavation.

.3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.4 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.5 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

### 1.2 REFERENCES

.1 ASTM International

.1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM D4491-99a (2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.3 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.4 ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

.5 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).

.2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.

.1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.

.2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.

.3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.

.4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.

.5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Test and Evaluation Reports:

.1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

## Part 2 Products

### 2.1 MATERIAL

.1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.

.2 Properties:

.1 Weight: Minimum 136 g/$m^2$.

.2 Grab Tensile Strength: Minimum 445 N.

.3 Grab Elongation: 50 %.

.4 Tear Resistance: Minimum 222 N.

.5 Puncture Resistance: Minimum 289 N.

.6 Mullen Burst: Minimum 1481 N.

.7 Permittivity: Maximum 2.0 $Sec^{-1}$.

.8 Water Flow Rate: Maximum 5700 l/min/m2.

.9 Apparent Opening Size (AOS): 0.212 mm

.10 UV Stability: Minimum 70 % @ 500 hours.

.3 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/$m^2$to ASTM A123M.

.4 Factory seams: sewn in accordance with manufacturer's recommendations.

.5 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

## Part 3 Execution

### 3.1 INSTALLATION

.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.5 Join successive strips of geotextile by sewing.

.6 Pin successive strips of geotextile with securing pins at midpoint of lap.

.7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.8 After installation, cover with overlying layer within 4 hours of placement.

.9 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

.10 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

## 3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

## 3.3 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**

## Part 1 General

### 1.1 STANDARD

.1 All work of this section shall comply with the requirements of the most recent version of the PEITIE standard specifications.

### 1.2 REFERENCE STANDARDS

.1 Prince Edward Island Department of Transportation, Infrastructure and Energy Standard Specifications (most recent version):

.1 PEITIE Standard Specification Item 208 – Fine Grading

.2 PEITIE Standard Specification Item 212 – Topsoil and Landscaping

## Part 2 Products

### 2.1 MATERIAL

.1 Per the most recent version of the PEITIE Standard Spec item 212.

.2 Topsoil must be free from invasive species/noxious weeds. Inspection of topsoil with weed cover shall take place prior to stripping topsoil from a source location by Parks Canada EPO.

## Part 3 Execution

### 3.1 GENERAL

.1 As per the most recent version of the PEITIE Standard Spec and in conformance with the contract documents.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

### 1.2 REFERENCES

.1 ASTM International

.1 ASTM A48/A48M-03(2012), Standard Specification for Gray Iron Castings.

.2 ASTM A123/A123M-2012, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. ASTM C478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

.2 CSA Group

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data and Shop Drawings:

.1 Submit manufacturer's instructions, printed product literature and data sheets for maintenance holes and catch basin structures and include product characteristics, performance criteria, physical size, finish and limitations.

### 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect maintenance holes and catch basin structures from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

## Part 2 Products

### 2.1 MATERIALS

.1 Polyethylene catch basin sections: to ASTM D3350.

.2 Joints: made watertight using multiaxial gasket welded to catchbasin wall.

.3 Frames and covers:

.1 All catchbasin grates shall be made from S Series Cast Iron.

.4 Precast maintenance hole and valve chamber units: to ASTM C478M, circular.

.5 Joints: made watertight using rubber rings.

.6 Adjusting rings: to ASTM C478M.

## Part 3 Execution

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and as indicated.

.2 Obtain approval of Departmental Representative before installing lift station structures, maintenance holes or catch basins.

### 3.3 INSTALLATION

.1 Corrugated catch basin manhole unit to be installed as per Manufacturer’s instructions.

.2 Construct unit in accordance with details indicated, plumb and true to alignment and grade.

.3 Complete units as pipe laying progresses.

.1 Maximum of 3 units behind point of pipe laying will be allowed.

.4 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing granular base.

.5 Set catch basin base on 150 mm minimum of granular bedding compacted to 100% SPMDD to ASTM D698.

.6 Precast units:

.1 Make each successive joint watertight with approved rubber ring gaskets.

.2 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.7 Compact granular backfill to 98% SPMDD to ASTM D698.

.8 Installing units in existing systems:

.1 Where new unit is installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.

.2 Make joints watertight between new unit and existing pipe.

.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.9 Place frame and cover on top section to elevation as indicated.

.1 If adjustment required use concrete ring.

.10 Clean units of debris and foreign materials.

.1 Remove fins and sharp projections.

.2 Prevent debris from entering system.

.11 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave work area clean at end of each day.

.12 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.13 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

## 3.4 TESTING FOR SANITARY MANHOLES

.1 The contractor is to ensure that the manholes are water tight.

.2 Contractor is to follow manufacturers and Engineers instructions for testing manholes.

.3 Backfill prior to testing.

.4 Notify Engineer 24 hours in advance of proposed test. Do test in presence of Engineer.

.5 Vacuum Test:

.1 Plug all inlet and outlet pipes with secured, braced, watertight plugs.

.2 Place vacuum tester on top of the structure and draw a vacuum of 10" Hg.

.3 The length of time for testing will be no less than:

.1 60 seconds for structures up to and including 1,250 mm.

.2 75 seconds for 1500 mm structures.

.3 90 seconds for 1800 mm structures.

.4 The allowable vacuum drop shall not be greater than the 1" Hg over the specified time period.

.5 If the structure fails the initial test, the contractor shall locate and make any repairs with an Engineer approved non-shrink quick setting material and then retest the structure. Only grouting of seams is permitted. If grouting of interior surface of concrete is required, then the engineer reserves the right to have the structure removed and replaced at no additional cost.

.6 Repair visible leaks regardless of test results

## 3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

### 1.2 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA B301-10, Standard for Liquid Chlorine.

.2 ANSI/AWWA C651-05, Standard for Disinfecting Water Mains.

.3 ANSI/AWWA C800, Standard for Underground Service Line Valves and Fittings.

.4 ANSI/AWWA C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Transmission and Distribution.

.5 ANSI/AWWA C652 – Disinfection of Water-Storage Facilities

.2 CSA International

.1 CAN/CSA-B137 Series, Thermoplastic Pressure Piping Compendium. Consist of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8 B137.9, B137.10, B137.11 and B137.12.

.1 CAN/CSA-B137.1, Polyethylene Pipe, Tubing, and Fittings for Cold Water Pressure Services.

.2 CAN/CSA-B137.3, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certification: to be marked on pipe.

**1.4 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

## Part 2 Products

**2.1 PIPE, JOINTS AND FITTINGS**

.1 Polyvinyl chloride pressure pipe: to ANSI/AWWA C900, pressure class 150, DR 18, 1 MPa gasket bell end.

.1 CAN/CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket coupling.

**2.2 VALVES**

.1 Flow control valve: Cla-Val Model 40-01 Rate of Flow Control Valve, 4”, threaded and flanged, ductile iron body to ASTM A536.

**2.3 WARNING MESH WITH TRACER WIRE**

.1 General: Warning mesh to be installed above plastic piping complete with tracer wire for above-ground detection of pipe locations,

.1 Blue mesh to be used for water piping.

.2 Mesh to be buried above pipe a minimum of 300 metres below grade.

**2.4 GRANULAR BEDDING AND BACKFILL**

.1 As indicated on drawings and to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

## Part 3 Execution

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

## 3.2 PREPARATION

.1 Clean pipes, fittings, valves, and appurtenances of accumulated debris and water before installation.

.1 Inspect materials for defects to approval of Departmental Representative.

.2 Remove defective materials from site as directed by Departmental Representative.

## 3.3 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Ensure trench depth allows coverage over pipe of 1.2 m minimum from finished grade unless indicated otherwise

.3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

## 3.4 GRANULAR BEDDING

.1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to 98% SPMDD to ASTM D698.

.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling with compacted bedding material.

## 3.5 PIPE INSTALLATION

.1 Lay pipes to manufacturer's standard instructions and specifications.

.1 Do not use blocks except as specified.

.2 Join pipes in accordance with manufacturer's recommendations.

.3 Bevel or taper ends of PVC pipe to match fittings.

.4 Handle pipe by methods recommended by pipe manufacturer and approved by Departmental Representative.

.5 Lay pipes on prepared bed, true to line and grade.

.6 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

.7 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.

.1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Position and join pipes with equipment and methods approved by Departmental Representative.

.9 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.10 Align pipes before jointing.

.11 Complete each joint before laying next length of pipe.

.12 Minimize deflection after joint has been made.

.13 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.14 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes.

.15 Do not lay pipe on frozen bedding.

.16 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.

.17 Backfill remainder of trench.

## 3.6 CONNECTING TO EXISTING SITE WATER SYSTEM

.1 Existing site water utility distributions system must be shut down prior to connecting new infrastructure.

.1 Contractor shall notify Departmental Representative at least 5 days in advance of proposed date when connections to existing site water utility distributions system are to occur.

## 3.7 HYDROSTATIC TESTING

.1 Do tests in accordance with ANSI/AWWA C600.

.2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.3 Notify Departmental Representative at least 24 hours in advance of proposed tests.

.1 Perform tests in presence of Departmental Representative.

.4 Test in sections not exceeding 365 m in length.

.5 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed as directed by Departmental Representative.

.6 Leave valves, joints and fittings exposed.

.7 Open valves.

.8 Expel air from main by slowly filling main with potable water.

.1 Install corporation stops at high points in main where no air-vacuum release valves are installed.

.2 Remove stops after satisfactory completion of test and seal holes with plugs.

.9 Thoroughly examine exposed parts and correct for leakage as necessary.

.10 Apply leakage test pressure of 1035 kPa minimum after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 hours.

.11 No leakage is permitted by the test.

.12 Locate and repair defects if leakage is observed.

.13 Repeat test until defects have been corrected.

.14 Chlorine residuals should not exceed 2 µg/L for discharges to receiving waters. Chemical dechlorination of chlorinated water is mandatory prior to discharge.

.1 Dechlorination agent shall be sodium thiosulfate in powder/crystal form. Required dose is 1.9 mg/mg Cl at a pH of 7.0.

## 3.8 PIPE SURROUND

.1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated on drawings.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to at least 98% SPMDD to ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 98% SPMDD to ASTM D698.

## 3.9 BACKFILL

.1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated on drawings.

.2 Do not place backfill in frozen condition.

.3 Under roadways and walkways, compact backfill to at least 98% SPMDD.

.1 In other areas, compact to at least 95% SPMDD to ASTM D698.

## 3.10 FLUSHING AND DISINFECTING

.1 Flushing and disinfecting operations: to be carried out by the Contractor.

.1 Notify Departmental Representative at least 2 days in advance of proposed date when disinfecting operations will begin.

.2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 0.8 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.

.3 Flushing flows as follows:

| Pipe Size NPS | Flow (L/s) Minimum |
|---|---|
| 6 and below | 38 |
| 8 | 75 |
| 10 | 115 |
| 12 | 150 |

.4 Provide connections and pumps for flushing as required.

.5 Open and close valves, hose bibbs and service connections to ensure thorough flushing.

.6 When flushing has been completed, introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system.

.7 Disinfect water mains as per the latest version of the Parks Canada Potable Water Guidelines and Standards for Parks Canada Agency and as per ANSI/AWWA C651-652.

.8 Rate of chlorine application to be proportional to rate of water entering pipe.

.9 Chlorine application to be close to point of filling water main and to occur at same time.

.10 The chemical feed rate should be such that it will produce a concentration of approximately 50 mg/L when mixed with incoming water. The feed should continue until a residual of 25 mg/L can be measured in the flow at the end of the line. The flow should be stopped and the chlorine allowed to remain in the pipe for at least 24 hours. A higher dose of chlorine can be used for a shorter time. The concentration should be at least 300 mg/L for a 3 hour contact period.

.11 Operate valves, hose bibbs and appurtenances while main contains chlorine solution to ensure chlorinated water is conveyed fully through the system.

.12 After 24 hours, take further samples to ensure that there is still a minimum of 10 mg/L chlorine residual in the system.

.13 Flush line to remove chlorine solution after disinfection period is ended. Chlorinated water shall not be allowed to enter waterways, wetlands or other natural water bodies during flushing.

.14 Measure chlorine residuals at extreme end of pipe-line being tested.

.15 Perform bacteriological tests on water main, after chlorine solution has been flushed out.

.1 Take samples daily for minimum of 2 days.

.2 Should contamination remain or recur during this period, repeat disinfecting procedure.

.3 Sampling may cease when results indicate bacteriological counts of 0 CFU/100 mL of *Escherichia coli* and 0 CFU/100 mL coliform on two consecutive days of sampling.

.16 Chlorine residuals should not exceed 2 µg/L for discharges to receiving waters. Chemical dechlorination of chlorinated water is mandatory prior to discharge.

.1 Dechlorination agent shall be sodium thiosulfate in powder/crystal form. Required dose is 1.9 mg/mg Cl at a pH of 7.0.

## 3.11 SURFACE RESTORATION

.1 After installing and backfilling over water mains, restore surface as indicated.

## 3.12 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 33 11 16 – Site Water Utility Distribution Piping

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for pump and include product characteristics, performance criteria, physical size, finish and limitations.

### 1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pump from damage.

.3 Replace defective or damaged materials with new.

## Part 2 Products

### 2.1 WELL PRODUCTS

.1 Well Appurtenances

.1 50 mm MAASS Pitless Adapter

.2 Vermin Proof Well Cap

.2 Submersible Well Pump

.1 Grundfos SP 77S15-3 (1.5 hp)

## Part 3 Execution

### 3.1 PUMPING SYSTEM INSTALLATION

.1 Install well pump and appurtenances in accordance with Section 33 11 16 – Site Water Utility Distribution Piping.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling

### 1.2 REFERENCE STANDARDS

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA C207-[07] , Standard for Steel Pipe Flanges for Waterworks Service, Sizes 4 Inch Through 144 Inch (100 mm Through 3,600 mm).

.2 ANSI/AWWA C900-07 , Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inch Through-12 Inch (100 mm-300 mm), for Water Transmission and Distribution.

.2 ASTM International (ASTM)

.1 ASTM D2241-09, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

.3 CSA International

.1 CSA B137 Series-09, Thermoplastic Pressure Piping Compendium.

.1 CSA B182.2-11, PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings

.2 CSA B182.11-11, Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 Requirements - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Prince Edward Island, Canada.

.4 Certification: to be marked on pipe.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

# Part 2 Products

## 2.1 MATERIALS

.1 Pressure pipes And fittings: Sch 80 PVC to CSA B137.3

.1 All connections to be solvent weld.

## 2.2 GRANULAR BEDDING AND BACKFILL

.1 As indicated on drawings and to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

# Part 3 Execution

## 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

## 3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Clean pipes and fittings of debris and water before installation and remove defective materials from site to approval of Departmental Representative.

.3 Pipes and fittings to be clean and dry.

.4 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

**3.3 TRENCHING**

.1 Do trenching Work in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

.2 Ensure trench depth allows coverage over pipe of 1.5 m minimum from finished grade unless indicated otherwise

.3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

**3.4 GRANULAR BEDDING**

.1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to 98% SPMDD to ASTM D698.

.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling with compacted bedding material.

**3.5 INSTALLATION**

.1 Lay pipes to manufacturer's standard instructions and specifications.

.2 Join pipes in accordance with manufacturer's recommendations.

.3 Handle pipe by methods recommended by pipe manufacturer and approved by Departmental Representative.

.4 Lay pipes on prepared bed, true to line and grade.

.5 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.

.6 Position and join pipes with equipment and methods approved by Departmental Representative.

.7 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.8 Align pipes before jointing.

.9 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.10 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes.

.11 Do not lay pipe on frozen bedding.

.12 Backfill remainder of trench.

**3.6 THRUST BLOCKS**

.1 Restrain bends, tees and fittings using concrete thrust blocks.

.2 Keep pipe couplings free of concrete.

.3 Bearing area of thrust blocks to be as indicated.

**3.7 PIPE SURROUND**

.1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated on drawings.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to at least 98 % SPMDD to ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 98 % SPMDD to ASTM D698.

**3.8 BACKFILL**

.1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated on drawings.

.2 Do not place backfill in frozen condition.

.3 Under roadways and walkways, compact backfill to at least 98% SPMDD.

.1 In other areas, compact to at least 95% SPMDD to ASTM D698.S

**3.9 FIELD TESTING AND COMMISSIONING**

.1 Testing of force main to be carried out in presence of Departmental Representative.

.2 Strut and brace caps, bends and tees, to prevent movement when test pressure is applied.

.3 Expel air from force main, by slowly filling main with water.

.1 Drill and tap high points and install suitable cocks to vent air and to be shut when pressure is applied.

.2 Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.

.4 Apply hydrostatic test pressure of 100 psi (690 kPa).

.5 Apply pressure for 1 hour for pressure test and 2 hours for leakage test.

.6 Examine exposed pipe, joints and fittings while system is under pressure.

.7 Remove defective joints, pipe and fittings and replace with new sound material.

.8 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 hours.

.9 Do not exceed allowable leakage of 1 litre per 100 m tested.

.10 Locate and repair defects if leakage is greater than amount specified.

.11 Repeat test until leakage is within specified allowance for full length of force main.

.12 Contractor to exercise and operate all valves in the presence of the Departmental Representative to confirm the system is operational.

.13 Contractor to provide notice of completed commissioning and turn over system to the Owner after approval by the Departmental Representative.

## 3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 35 29.06 – Health and Safety Requirements

.3 Section 01 35 43 – Environmental Procedures

.4 Section 01 74 11 – Cleaning

.5 Section 01 74 21 - CD Waste Management and Disposal

.6 Section 01 78 00 – Closeout Submittals

.7 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.8 Section 33 05 16 - Manhole Holes and Catch Basin Structures.

.9 Section 33 31 13 – Public Sanitary Utility Sewerage Piping.

.10 Section 33 31 23 – Sanitary Sewerage Force Main Piping.

### 1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)

.1 ANSI/AWWA C500 86, Gate Valves for Water and Sewage Systems.

.2 ANSI/AWWA C504-1988, Valves, Rubber-Seated, Butterfly.

.3 ANSI/AWWA C508-82, Valves for Waterworks Service, 2-inch (50 mm) through 24-inch (600 mm) NPS, Swing-Check.

.2 ASTM International (ASTM)

.1 ASTM C 478M-90, Standard Specification for Precast Reinforced Concrete Manhole Sections.

.3 CSA Group (CSA)

.1 CAN/CSA B70 M91, Cast Iron Soil Pipe, Fittings and Means of Joining.

### 1.3 DESCRIPTION OF SYSTEM

.1 Wet well sewage lift station:

.1 Fully automatic, consisting of duplex submersible pumps mounted on rail system. Control to be by 4 float sensors.

.2 Pumps to alternate as lead pump on each cycle.

.3 Incorporate time delay relays in control circuits to allow continuation of pump for pre-set time after normal pump shut down signal is received.

.4 Operate both pumps when lag pump "ON" water level is reached in wet well. Lag pump to shut off when water level drops to pump "OFF" water level.

.5 Locate control system panel.

.2 Lift station to be complete with valves, fittings, etc. based on the following:

.1 Precast reinforced concrete enclosures. Pumping system to be factory assembled and disassembled for shipment with mating components clearly identified. Principal items of equipment to include two identical submersible sewage pumping units, all internal piping and valves, liquid level controls, lifting chains, guide bars, vents, cover, safety grating, electrical wiring, and control panel.

.3 Equipment and installation including as follows:

.1 Dewatering of excavation.

.2 Excavation for sewage lift station.

.3 Placement of mud slab, if required.

.4 Connection of power to control panel as indicated.

.5 Connections to sanitary sewers and force mains.

.6 Supply and installation of packaged sewage lift stations in accordance with manufacturer's instruction.

## 1.4 SHOP DRAWINGS

.1 Submit shop drawings.

.2 Contractor to provide general arrangement drawing with shop drawing package. Submit all other shop drawings for civil, structural, hydraulic, mechanical and electrical elements.

.3 Indicate individual components by manufacturer’s model number accompany with technical and performance characteristics.

## 1.5 OPERATING PERSONNEL TRAINING

.1 Provide onsite training by qualified personnel for designated operating personnel prior to final commissioning. Training to be in accordance with training plan approved by Departmental Representative. Training plan shall be provided to Departmental Representative a minimum of two weeks in advance for review and approval.

.2 Provide training for designated personnel on all routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.

.3 Provide safety precaution procedures for all systems.

## 1.6 SCHEDULING

.1 Schedule work to minimize interruptions to existing services.

.2 Coordinate any existing service disruptions with Departmental Representative a minimum of one week prior to planned disruption.

## 1.7 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's instructions, printed product literature and data sheets for associated equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Prince Edward Island, Canada.

.2 Submit drawings for civil, structural, hydraulic, mechanical and electrical elements.

.3 a complete schedule clearly identified to facilitate re ordering.

## 1.8 CLOSEOUT SUBMITTALS

.1 Provide in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: Provide operation and maintenance data for sewage lift station for incorporation into manual.

.3 Include information as follows:

.1 Record drawings, wiring diagrams, electrical schematics of equipment as installed.

.2 Interconnections with numbers and wire sizes.

.3 Certified pump characteristic curves.

.4 Detailed operation and maintenance instructions.

.5 Parts list comprising complete schedule clearly identified to facilitate re-ordering.

## 1.9 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions where applicable.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturers recommendations in clean, dry, well-ventilated area.

.2 Store and protect packaged sewer lift from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

# Part 2 Products

## 2.1 WET WELL STRUCTURE

.1 The diameter of the wet well shall be as indicated on drawings.

.2 Materials:

.1 Precast concrete to CAN/CSA-A257 and/or ASTM C478M.

.2 With access openings.

.3 Structure to be free of leakage and designed for the following forces:

.1 Dead load of station and components, dynamic and kinetic forces of rotating equipment.

.2 Dead load from soil over structure, superimposed live load of 12 kN/m$^2$ or single wheel load of 54 kN over an area of 750 x 750 mm.

.3 Hydrostatic uplift forces.

.4 Horizontal earth loading and full hydrostatic pressure assuming water at elevation 0.5m below grade.

.4 Waterproof exterior surfaces below grade with a waterproofing agent. Acceptable product – Paqco-P60 or similar approved product.

## 2.2 ACCESS HATCH

.1 Aluminum gratings and covers to bear evenly on frames.

.2 Frame with grating or cover to constitute one unit.

.3 Recessed lockable hasp

.4 Integral safety grate

.5 Min opening 1000 mm by 780 mm, or to facilitate removal of pump, whichever is greater

.6 Hinge to allow for securing in open position

.7 Two hatches required, one for each pump.

## 2.3 PUMPS

.1 Characteristics: as indicated on drawings. Acceptable product is Hydromatic SPX50 ½ HP, 200V, single-phase pumps (or approved alternate).

.2 Volute casing: cast iron, minimum grade Class 30, close coupled.

.3 Impeller: cast iron, minimum grade Class 30, close coupled.

.4 Capable of passing 50 mm solid sphere.

.5 The pumps are sized to provide cleansing velocities.

.6 Product data including specific pump curve data and efficiencies will be requested.

.7 Pumps shall be supplied with a waterproof cable connection or junction box suitable for location in a wet location. Pumps shall be factory-wired with an adequate length of Chlorinated Polyethylene (CPE) jacked SOW-type cable of suitable capacity rating for motor current.

.8 A mix flush valve shall be supplied on one of the pumps in the wet well.

.9 Pumps shall be supplied with high temperature and seal failure sensors and cabling for connection to the control panel at each station.

.10 The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by stainless steel washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

## 2.4 PUMP LIFTING SYSTEM

.1 Pumps to be complete with sliding guide and brackets, chains and quick leak-proof disconnect to discharge piping, all allowing for withdrawal of pumps.

.2 Provide galvanized lifting chain or stainless-steel cable for each pump accessible from access hatches.

.3 Galvanized steel pipe to act as quick rails for pump.

.4 Pumps shall be lifted via portable davit. Davit and base to be provided for the station.

.5 Bearings:

.1 The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

.6 Mechanical Seal:

.1 Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating corrosion resistant, tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating corrosion resistant, tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For unique applications, other seal face materials shall be available.

.2 The following seal types shall not be considered acceptable nor equal to the dial independent seal specified: shaft seals without positively driven rotating

members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

.3 Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate non-submerged without damage while pumping under load.

.4 Seal lubricant shall be non-toxic and FDA Approved.

.7 Pump Shaft:

.1 Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T.

.2 The use of stainless-steel sleeves will not be considered equal to stainless steel shafts as shaft sleeves only protect the shaft around the lower mechanical seal.

## 2.5 SUBMERSIBLE MOTORS

.1 The pump motor shall be as specified for Hydromatic SPX50 ½ HP pumps (or approved alternate). Motor shall be a NEMA Type N design.

.2 The stator windings shall be insulated with moisture resistant Class B insulation rated for 130°C (266°F). The motor shall be designed for continuous duty handling pumped media of 60°C (140°F)

.3 The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operations up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

.4 The power cable shall be sized according to the CEC and CSA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet (20 meters) or greater.

.5 The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

.6 Motor cooling system:

.1 Pumps with motors up to 10-hp: motors are sufficiently convection-cooled by the surrounding environment or pumped media.

.7 Motor Protection:

.1 All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor an activate an alarm.

.2 A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. Use of voltage sensitive solid-state sensors and trip temperature above 125°C (260°F) shall not be allowed.

.3 The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS monitoring unit shall be designed to be mounted in any control panel.

## 2.6 PUMP CONTROL SYSTEM

.1 Liquid level regulators shall be provided to control the operation of the pumps, unless otherwise indicated, in accordance with variations of sewage levels in the pump chamber.

.2 Float type level regulators shall consist of a switch enclosed in a watertight polypropylene casing and shall be suspended from the top of the pump chamber by means of a three conductor, SJOW or PVC-jacketed cable and set at pre-determined elevations within the pump chamber.

.1 The centre of gravity of the float type level regulator being in a different position from the centre of buoyancy, results in the regulator tilting whenever the liquid level reaches it, thus activating the switch to energize or de-energize the control circuit.

.2 The float type level regulator shall be installed on a galvanized hanger fitted with non-metallic cable glands. Level regulator cables shall run directly to the control panel. Cable lengths shall be selected to suit site conditions without the need for splicing.

.3 Provide the following independently adjustable control levels, measured from bottom of wet well: as indicated on drawings.

.4 Pump controls to include alternating function to provide automatic pump alteration for each pumping cycle when pump sequence selection switch is in Automatic. On automatic mode, pump to be allowed to run only when dry contact would be set by main plant PLC, whatever the water level.

## 2.7 VALVES

.1 Plug valves to flange ends ANSI B1611.

.2 Check valves: Class 125, swing check type, spring loaded lever, stainless steel shaft, to ANSI/AWWA C508.

## 2.8 ELECTRICAL CONTROL PANEL AND WIRING

.1 All components to be CSA, UL/CUL approved.

.2 Electrical equipment in station to requirement for Hazardous Locations, Class 1, Zone 1, Group D.

.3 The existing pump control panel shall be the connection and control point for the new lift station.

.4 Wiring

.1 All conductors shall be copper.

.2 A single ground connection lug shall be used for equipment grounding.

.3 Panel wiring shall be numbered with printed permanent identifying plastic tapes to correspond to schematic diagram.

.4 Terminated for external control connections by tubular screw type terminal blocks with barrier and labels.

.5 Equipped with grommets and shield for mechanical protection.

.6 Adequately supported and installed to approval of Departmental Representative.

## 2.9 OTHER MATERIALS

.1 Contractor to supply and install all remaining items as detailed and/or required to complete the installation.

.2 Access frames and cover are to be fully galvanized and have recessed lockable hasps and be suitable for a duplex pumping station. Acceptable product - FLYGT or approved alternate.

.3 Interior ladder to be one piece rung and rail construction and hot dipped galvanized.

## 2.10 SOURCE QUALITY CONTROL

.1 Perform operational tests on pumps at factory to check for excessive vibration, for leaks in piping or seals and for correct operation of automatic control system and auxiliary equipment. Pump suction and discharge lines to be coupled to reservoir and pumps to recirculate water for minimum of 1 hour under simulated service conditions.

.2 Provide certification that pumps and controls have been factory tested and deficiencies rectified prior to delivery to site.

# Part 3 Execution

## 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewage lift installation in accordance with manufacturer’s written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

## 3.2 EXCAVATION BACKFILLING AND COMPACTION

.1 Excavate, backfill and compact in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Before installing pumping station structure, ensure that it is in the proper location and elevation.

## 3.3 LIFT STATION

.1 Do concrete work in accordance with Section 33 05 16 - Maintenance Holes and Catch Basin Structures.

.2 Make watertight and test sewage lift station chamber.

.3 Set bottom section of precast unit on 300mm base of imported drainage gravel. Make each successive joint watertight with approved rubber ring gasket or ramnek.

.4 Plug lifting holes with concrete plugs set in cement mortar or mastic compound.

## 3.4 EXFILTRATION TEST

.1 Plug all inlet and outlet pipes with water tight plugs.

.2 Fill with water to top of precast sections.

.3 Allow time for initial absorption.

.4 Measure and record volume of water required to maintain level for one hour.

.5 Leakage not to exceed 5.0 litres per hour per 1000mm diameter per 1000mm of height.

## 3.5 FACTORY TEST

.1 Perform operational tests on pumps at factory to check for excessive vibration, for leaks in piping or seals and for correct operation of automatic control system and auxiliary equipment. Pump suction and discharge lines to be coupled to reservoir and pumps to recirculate water for minimum of 1 hour under simulated service conditions.

.2 Provide certification that pumps, and controls have been factory tested and all deficiencies rectified prior to delivery to site.

## 3.6 EQUIPMENT INSTALLATION

.1 Install equipment, piping and controls in accordance with manufacturer’s recommendations.

## 3.7 WATERPROOFING

.1 The concrete structure to have a waterproofing agent applied to the outside face of the structure. Acceptable product – Paqco-P60 or approved alternate.

## 3.8 ELECTRICAL INSTALLATION

.1 Electrical works associated to pumping station, including installation of pump wiring, floats, and control panel, plus supply and installation of additional conduits, supplementary wiring, connections, junction boxes, disconnect switch, are deemed to be part of electrical work subcontractor scope of work. General contractor is still responsible for coordination between trades (civil, mechanical, and electrical).

.2 Ducts for primary electric service shall meet Maritime Electric requirements for materials and placement. All other trenching and conduit placement shall meet provincial inspection requirements.

.3 Conduit shall have mechanical protection as shown on drawing, and thermal expansion joints shall be used wherever the conduit rises vertically from the ground.

.4 Wiring from the panel to pumps and level switches shall be in ridge galvanized conduit to inside of wells and in accordance with Sections 2.7 and 3.6.

.5 All workmanship and materials shall be of high quality and grade and suited for the purpose.

## 3.9 FIELD QUALITY CONTROL

.1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Departmental Representative.

.2 Test in presence of Departmental Representative and representative from equipment supplier.

.3 Provide labour and ancillary equipment necessary to fulfil tests.

.4 Test to demonstrate that:

.1 Pumps and equipment run free from heating, or vibration.

.2 Operation meets requirements of these specifications.

.3 Pumps and pumping are free and clear of debris and obstructions.

.5 Replace equipment found defective.

.1 Repeat test until equipment is accepted by Departmental Representative.

## 3.10 FUNCTIONAL TESTING

.1 Equipment supplier’s representative to inspect and approve of installation prior to station start up.

.2 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Consultant.

.3 Confirm all piping, joints, fittings and valves are watertight at operational pressure. Connection to existing forcemain outside pumping station shall be visible during the testing procedure.

.4 Test in presence of Consultant and representative from equipment supplier.

.5 Equipment supplier's representative to provide a written report of start-up.

.6 Provide all labour and ancillary equipment necessary to fulfil tests.

## 3.11 DEMONSTRATION

.1 Operating Personnel Training

.1 Provide on site training by qualified personnel for designated operating personnel prior to final commissioning.

.1 Schedule and deliver training in accordance with training plan approved in writing by Departmental Representative.

.2 Include training for 3 designated personnel on routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.

.3 Include safety precaution procedures for systems.

## 3.12 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - CD Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

Approved: 2019-01-30

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling

### 1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM F405-05, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

.2 ASTM F667-06, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

.3 ASTM F794-03 (2009), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

.2 CSA Group (CSA)

.1 CSA A257 Series-M92 (R2009), Standards for Concrete Pipe.

.2 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.

### 1.3 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and backfill and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Prince Edward Island, Canada.

.4 Samples:

.1 Inform Departmental Representative least 2 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.

.5 Certification to be marked on pipe.

.6 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

.7 Manufacturer's Instructions: submit to Departmental Representative 1 copy of manufacturer's installation instructions.

## 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

# Part 2 Products

## 2.1 PLASTIC PIPE

.1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D3034.

.1 Standard Dimensional Ratio (SDR): 35.

.2 Locked-in gasket and integral bell system.

.3 Nominal lengths: 4 m.

.2 Large diameter, ribbed PVC sewer pipe and fittings: to ASTM F794.

.3 Corrugated polyethylene pipe: high density to ASTM F667.

.1 Sol-Flo Max, or approved alternate.

.2 Locked-in gasket and integral bell system.

.3 Nominal lengths: 6 m.

.4 Smooth wall interior.

.4 Storm Infiltrator Chambers: to ASTM F2418 and ASTM F2787.

.1 Hydrostor 180, or approved alternate.

.2 Joints: overlap the corrugations of longitudinally adjacent chambers along lengths of chambers. Chambers and joints shall be installed in the direction stamped in the valley of the corrugation.

.3 Soleno Hydrostor Geogrid (or approved alternate) required, to be supplied with infiltrator chambers.

**2.2 GRANULAR BEDDING AND BACKFILL**

.1 As indicated and to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

**Part 3 Execution**

**3.1 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.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Clean pipes and fittings of debris and water before installation and remove defective materials from site to approval of Departmental Representative.

**3.2 TRENCHING**

.1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

**3.3 GRANULAR BEDDING**

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.1 Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 100% Standard Proctor.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

.7 Contractor to provide sample of bedding to Departmental Representative, minimum of two weeks in advance to complete maximum density test and obtain results.

## 3.4 INSTALLATION

.1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.2 Handle pipe using methods approved by Departmental Representative.

.1 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 inverts smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Joint deflection permitted within limits recommended by pipe manufacturer.

.6 Water to flow through pipes during construction only as permitted Departmental Representative.

.7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 When any stoppage of work occurs, restrain pipes to prevent "creep" during down time.

.9 Install plastic pipe and fittings in accordance with CAN/CSA-B1800.

.10 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.

.11 Make watertight connections to manholes and catch basins.

.1 Use shrinkage compensating grout when suitable gaskets are not available.

.12 Use approved field connections for connecting pipes to existing sewer pipes.

.1 Joint to be structurally sound and watertight.

.13 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

## 3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.1 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.

.1 Do not dump material within 0.3 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 100% Standard Proctor.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 95% Standard Proctor.

.7 Contractor to provide sample of pipe surround to Departmental Representative, minimum of two weeks in advance to complete maximum density test and obtain results.

## 3.6 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 100 % Standard Proctor. In other areas, compact backfill to at least 100% Standard Proctor. In other areas, compact to at least equal to the density of adjacent, undisturbed soil.

.4 Contractor to provide sample of backfill to Departmental Representative, minimum of two weeks in advance to complete maximum density test and obtain results.

## 3.7 FIELD TESTS AND INSPECTIONS

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 Remove foreign material from sewers and related appurtenances by flushing with water.

## 3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Division 1.

.2 Section 26 05 00 - Common Work Results for Electrical.

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

### 1.3 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.2 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

.1 Manufacturer's Instructions: for installation and special handling criteria, installation sequence and cleaning procedures.

### 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## Part 2 Products

### 2.1 PVC DUCTS AND FITTINGS

.1 Rigid PVC duct: Schedule 40, with fittings, for direct burial, size as indicated.

.2 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.

.3 Rigid PVC 90 degrees, 45 degrees bends and 5 degrees angle couplings as required.

**2.2 SOLVENT WELD COMPOUND**

.1 Solvent cement for PVC duct joints.

**2.3 CABLE PULLING EQUIPMENT**

.1 6 mm stranded nylon pull rope tensile strength 5 kN.

**2.4 WARNING TAPE**

.1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW".

## 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 datasheets.

**3.2 INSTALLATION**

.1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.

.2 Clean inside of ducts before laying.

.3 Install plastic duct spacers and ensure full, even support every 1.5 m and smooth transition throughout duct length.

.4 Slope ducts with 1 to 400 minimum slope.

.5 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.

.6 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.

.1 Pull stiff bristle brush through each duct immediately before pulling-in cables.

.7 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.

.8 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.

.9 Install markers as required.

.10 Notify the Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

## 3.3 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

# APPENDIX A

# ENVIRONMENTAL IMPACT ANALYSIS (EIA)
# RECORD OF DECISIONS & BMPs