

SPECIFICATIONS

**PARKS CANADA
FUEL TANK REPLACEMENT
INGONISH, NS**



Prime Consultants:
**Coles Associates Ltd.
Architects & Engineers**

May 11, 2015

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1 General

1.1 LIST OF DRAWINGS

- .1 D1 Demolition
- .2 M1 Mechanical
- .3 M2 Details

End of Section

1 General

1.1 SCOPE OF WORK

- .1 The Contractor is to provide each item, and properly execute all work as specified herein, indicated by drawings, addenda, or change orders issued with respect to this project.
- .2 The Contractor shall coordinate, administer, and supervise all work, material acquisition and labour.
- .3 All work required by this contract shall be performed by persons licensed for the work of each trade or equipment installations noted herein.
- .4 General:
 - .1 Before submitting a tender for the work, a non-mandatory scheduled site visit will take place which will be noted with a date and time as part of this tender. Inspect the site of the proposed work and become thoroughly familiar with the actual site conditions and requirements of the work and shall satisfy themselves as to the form and nature of the work, materials necessary for the completion of the works, the means of access to the site and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender.
 - .2 No claim will be entertained or allowed for any labor, materials or other extras required for proper execution and completion of the contract, which could have been determined by site examination.
 - .3 Submission of tender is deemed to be confirmation that tenderer has inspected the site and is conversant with all conditions affecting execution and completion of the work.
 - .4 The site of work described in these Contract Documents is located at the Ingonish Parks Canada Compound, 37486 Cabot Trail, Ingonish, NS.
 - .5 The work involves the provision of all work relating to the installation of two (2) new 4,500 litre +/- 5% gas & diesel fuel tanks and fuel delivery system including all associated mechanical, electrical and civil work as noted on the drawings and specifications as well as the removal and disposal of two (2) 4,500 litre gas & diesel fuel tanks & delivery system from service.
 - .6 Remove and dispose of all existing piping and electrical wiring.
 - .7 Provide an over pour and curb over the existing concrete foundation for a product transfer area around fuel tanks as required for demolition and installation of new materials indicated on drawings.
 - .8 Provide pipe stands as required to support new fuel lines, conduits and ancillaries.
 - .9 Provide clear identification on all new fuel piping. Provide identification on new fuel tanks, including lamacoid with fill instructions, tagging, Parks Canada registration number, no smoking, capacity, fuel type, WHMIS labels, operating signage, emergency contact number in case of spill, Environment Canada (EC) identification number (to be provided by Parks Canada) and labels required by regulations and Authority Having Jurisdiction (AHJ).
 - .10 Drain, cap and demolish, remove and dispose or salvage of in accordance with regulations and AHJ, existing aboveground tanks, aboveground piping.
 - .11 Provide overflow prevention device with camloc fill connection at 90% fill level. Provide electronic monitoring system for tank level, vacuum and leak detection.
 - .12 Provide anti-siphon valves and a main fuel shut-off valves for the new fuel tanks. Provide plastic tags for valves indicating that the valves are the main fuel shut-off.
 - .13 Contractor is responsible for acquiring, collecting, and presenting all data and information required for approval and registration of new tanks and aboveground lines with the AHJ, Environment Canada and the Department of Environment. New tanks to be installed and tagged by certified Installer.
 - .14 Contractor is responsible for cleaning, painting and labelling all exposed and accessible new fuel piping in accordance with Parks Canada standards.
 - .15 The work shall be scheduled in a manner that will minimize the disruption to the owner and vehicular traffic using the site. Work may be done during normal business hours if the work does not create disruption to client operations and comfort. Coordinate with the departmental representative 24 hours before starting work.
 - .16 Contractor responsible for safety barricades and signage to identify work areas and

- .17 prevent access by unauthorized personnel.
- .17 Provide training on the operation, maintenance and troubleshooting of the new fuel system and controls provided to Parks Canada Staff. Contractor must provide a minimum of 24 hours notice of training which must be done Mon - Fri between 8:00AM - 3:00PM.
- .18 The drawings provided are intended to convey the location of piping and equipment only. They should not be construed as or otherwise understood to be fabrication drawings. Contractor to confirm all site conditions prior to ordering and/or fabrication of any equipment.
- .19 Contractor responsible for first fill of two (2) tanks. Parks Canada to be responsible for cost of fuel. All work to be completed in accordance with federal and provincial regulations and AHJ. No filling to take place in new tanks until AS Built Drawings have been stamped and EC registration number has been received and marked on the tank. EC Registration number will be provided by Parks Canada.
- .20 Contractor to work with Parks Canada, Departmental Representative, and testing agencies to assist with the completion of any soil testing, material testing or additional independent third party testing being completed by the owner.
- .21 Contractor and all workers to be available for safety training sessions required by Parks Canada.
- .22 Warranty: All work and equipment in this contract shall carry a minimum warranty of one year.
- .23 Supply all Labour, Materials, Equipment, transportation and supervision to complete all work associated with the attached drawings and specification.
- .24 Workers to have and wear personal protection equipment (PPE).
- .25 Contractor to submit a Health and Safety Plan.
- .26 Contractor to provide all necessary safety signs as required.
- .27 Because this project is in a National Park, it is essential all existing features remain as found. Consequently, standards for environmental protection and for visual aesthetics of final product shall be of a quality standard. Contract limits shall be strictly adhered to and contractor is to take special care to minimize damage and disruption and protect existing features. The Departmental Representative is to be notified immediately in any historic or natural resources are located during construction.
- .28 Disturbed areas are to be left with 500mm of topsoil and are to be sodded to the surrounding contours.
- .29 Contractor responsible to arrange operations, site storage, temporary washrooms and facilities during the construction of work as required for the safe storage of all materials furnished to or by him until it has been incorporated in the completed project and accepted by the Departmental Representative. Any material lost or stolen or that otherwise disappears from the site shall be replaced by the contractor at his expense.
- .30 Parking for contractors is available on site. Maintain access to roads at all times during duration of project.
- .31 Contractor responsible for temporary power while on site.
- .32 All removed materials become the property and responsibility of the contractor and are to be removed from the site in accordance with all local, Provincial and Federal Environmental Legislation requirements. Contractor to provide documentation indicating materials have been disposed of in accordance with the regulations.
- .33 Unless specifically stated otherwise, the terms Departmental Representative and Engineer when used in the specifications and on the drawings shall mean the Departmental Representative (DR) as defined in the General Conditions of the contract.
- .5 Project completion date to be prior to September 30, 2015.

1.2 WORK BY OTHERS

- .1 Co-operate and coordinate with other Contractors in carrying out the respective works and carry out instructions from Departmental Representative.
- .2 Schedule the Work of this Contract in consultation and cooperation with the Work of other Contractors and/or Owners own forces to produce a coordinated construction schedule.
- .3 Work specifically excluded from this Contract:
 - .1 Site remediation of contaminated soil.

1.3 WORK SEQUENCE

- .1 Construct Work to accommodate Owner's continued use of existing premises during construction.
- .2 Coordinate Progress Schedule referred to in Section 01 32 16 - Construction Progress Schedule and coordinate with Owner Occupancy during construction.
- .3 Construct Work to provide for continuous public usage. Do not close off public usage of facilities.
- .4 Maintain fire access/control.

1.4 EXECUTION

- .1 Execute work with least possible interference or disturbance to building operations, public and normal use of premises.

1.5 DOCUMENTS

- .1 The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all.
- .2 Descriptions of materials or work which have well known technical or trade meanings shall be held to refer to such recognized standards.
- .3 Should the specifications conflict with the drawings, the specifications shall govern.
- .4 In the case of discrepancies between drawings, those of larger scale, or if the scale are the same, those of later date shall govern.
- .5 All drawings and specifications shall be interpreted in conformity with the agreement.

1.6 COMMUNICATION

- .1 All submissions and inquiries shall be directed to the Departmental Representative for review.
- .2 All direction will be transmitted to the Contractor by the Departmental Representative.

1.7 CODES AND REGULATIONS

- .1 Perform work in accordance with National Building Code of Canada (NBC) Canadian Environmental Assessment, Agency (CEAA), Canadian Environmental Protection Act (CEPA), National Fire Code of Canada (NFCC) Latest Edition. and any other code of Federal, Provincial or local application, provided that in any case of conflict or discrepancy the more stringent requirements shall apply.
- .2 Meet or exceed requirements of contract documents and specified standards.
- .3 References to standards, including manufacturer's direction for installation shall be the latest edition.
- .4 All materials, components and equipment as well as construction methods shall comply with the latest edition of the National Building Code and all other applicable Federal, Provincial codes or regulations.
- .5 The latest edition of the Canadian Electrical Code shall govern all electrical work, whether pre-wired an/or assembled remote from the site or not.
- .6 All equipment supplied or installed shall be CSA approved for the intended use.
- .7 The latest edition of the Federal and NS Occupational Health and Safety Act and Regulations shall govern safe construction practises.
- .8 Provide a copy of all certificates of acceptance issued by Federal, Provincial or local authorities.
- .9 Perform work to "Storage tank systems for petroleum products and allied petroleum products regulations - 2012", "Nova Scotia Standards for construction and installation of petroleum storage tank systems" and "Environmental code of practise for aboveground and underground storage tank systems containing petroleum and allied petroleum products (CCME)".

1.8 WORK SCHEDULE AND PROGRESS REPORTS

- .1 The Contractor will prepare and maintain a consolidated schedule in weekly increments showing scheduled work versus actual work. The schedule shall indicate the contract commencement and completion date for the total project.
- .2 The Contractor is to develop a detailed schedule identifying specific components of the mechanical, sprinkler, refrigeration and electrical trades. A single line items for each is not acceptable.

- .3 Provide updated schedule information from time to time as the progress of the work or Departmental Representative may require.
- .4 The Contractor shall furnish monthly progress reports from the date of commencement. These reports shall show the percentage of completion of the various divisions of work and contain comments on the general progress of the project.

1.9 CONTRACTOR'S USE OF SITE

- .1 Do not unreasonably encumber site with materials or equipment.
- .2 Move stored products or equipment, which interfere with operations of Departmental Representative or other Contractors.
- .3 Obtain and pay for use of additional off site storage or work areas needed for operations.
- .4 The work related to modifying the site roadways must be carried out so that one half of the roadway is open to vehicle traffic at all times.

1.10 PROJECT MEETINGS

- .1 Hold weekly project meetings at the site, in the Contractor's site office and at a time approved by Departmental Representative. In addition hold any additional meetings as the need arises or as directed by the Departmental Representative.
- .2 Notify all parties concerned of such meetings.
- .3 The Contractor will record minutes of meetings and distribute to all parties within three (3) days of meeting.
- .4 Failure of the Contractor to accurately record minutes or distribute the minutes in a timely manner will result in the Departmental Representative taking over the duties invoicing the owner and deducting an equal amount from the progress claims as compensation.

1.11 SITE INSPECTOR

- .1 No work is to be covered without having received approval from the Departmental Representative. The Departmental Representative will have the authority to cause any part of the work to cease, should, in his or her opinion, there be cause to do so.
- .2 This work shall be examined by the Departmental Representative and approval granted to resume when a satisfactory solution has been found out.
- .3 The Construction Manager does not have authority to authorize changes to work. He or she shall confer with the Departmental Representative who, if necessary will authorize any change.
- .4 The fact that the Construction Manager or Departmental Representative does not reject any work shall not remove the responsibility for completing all work as specified from the Contractor.

1.12 SETTING OUT OF WORK

- .1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations.
- .2 Provide all equipment, materials and devices needed to lay out and construct work.
- .3 Supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.

1.13 CONCEALMENT

- .1 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.14 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

- .3 Inform Departmental Representative of impending installation and obtain his approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.15 CUTTING, FITTING AND PATCHING

- .1 Execute cutting, core drilling, fitting and patching, required to install and make new work under this contract fit properly.
 - .1 Includes all cutting and patching in building for connection of new mechanical and electrical services to service lines.
- .2 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

1.16 BLOCKING AND BACKING

- .1 Provide all blocking, backing, hangers, etc. used for support of all built-in work.

1.17 EXISTING SERVICES

- .1 Before commencing work, establish the location and extent of service lines and notify Departmental Representative of findings if in conflict with information or intent shown.
- .2 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .3 Contractor shall pay for any or all repairs to existing services that have been damaged due to the Contractor's negligence in the course of his work.
- .4 Notify Departmental Representative and utilities of intended interruption of services and obtain permission.
- .5 Where Work involves breaking into or connecting to existing services, give Departmental Representative 24 hours notice for necessary interruption. Minimize duration of interruptions. Carry out Work at times as directed by governing authorities or Owner with minimum disturbance.
- .6 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
- .7 Provide alternative routes for personnel and vehicular traffic.
- .8 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by Authorities Having Jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.

1.18 ACCESS AND SECURITY

- .1 Access and security on the entire job site will be the responsibility of the Contractor.

1.19 ADDITIONAL DRAWINGS

- .1 The Departmental Representative may furnish as necessary for the execution of the work, additional instructions, by means of drawings or otherwise. All such additional instructions shall be consistent with the contract documents. In giving such additional instructions the Departmental Representative shall have authority to make minor changes in the work, not inconsistent with the contract.

1.20 RELICS AND ANTIQUITIES

- .1 Relics and antiquities and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during the work, shall remain property of the Owner. Protect such articles and request directives from Departmental Representative.
- .2 Give immediate notice to Departmental Representative if evidence of archaeological finds are encountered during construction, and await Departmental Representative's written instructions before proceeding with work in this area.

End of Section

1 General

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit 10 working days after award of contract 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, product data, samples and mock-ups 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.

1.2 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 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.
- .3 Allow 10 days for Departmental Representative's review of each submission.
- .4 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.
- .5 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.
- .6 Submissions 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.
- .7 After Departmental Representative's review, distribute copies.
- .8 Submit one transparency of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .9 Submit 6 copies 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.
- .10 Submit 3 copies 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.
- .11 Submit 3 copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .12 Submit 3 copies of manufacturers 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.
- .13 Submit 3 copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .14 Submit 3 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .15 Delete information not applicable to project.
- .16 Supplement standard information to provide details applicable to project.
- .17 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, transparency 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.

1.3 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where color, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples 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 samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

1.5 GENERAL

- .1 Make specified submittals to the Departmental Representative unless otherwise identified.
- .2 At Commencement of Contract (and no later than 10 days after award)
 - .1 Contract Security
 - .2 Cost Breakdown
 - .3 Permits as required
 - .4 Construction schedule for Trade Package activity
 - .5 Name of Project Superintendent
 - .6 Proof of Insurance
 - .7 Labour and Equipment rates
 - .8 Corporate Safety Plan
 - .9 Site specific safety plan
 - .10 Shop drawing schedule
 - .11 Workers' Compensation clearance letter
- .3 During Construction
 - .1 Updated trade construction schedule
 - .2 Shop drawings as required
 - .3 Inspection and test reports
 - .4 Request for Information
 - .5 Submission required for payment purposes
- .4 Completion of Work
 - .1 Submission at completion of work as specified in Project Close Out, Commissioning, and Operations and Maintenance Data Sections.

End of Section

1 General

1.1 SECTION INCLUDES

- .1 Fire Safety Requirements.
- .2 Hot Work Permit.
- .3 Existing Fire Protection and Alarm Systems.

1.2 RELATED WORK

- .1 Section 01 35 29 Health and Safety Procedures.
- .2 Section 01 35 25 Special Procedures on Lockout Procedures.

1.3 REFERENCES

- .1 Fire Protection Standards issued by Fire Protection Services of Human Resources Development Canada as follows:
 - .1 FCC No. 301 - June 1982 Standard for Construction Operations.
 - .2 FCC No. 302 - June 1982 Standard for Welding and Cutting.
 - .3 FCC standards, may be viewed at the Regional Fire Protection Services' office (previously known as the Fire Commissioner of Canada) located at 99 Wyse Road, 8th Floor, Dartmouth, NS, Tel: (902)426-6053.

1.4 DEFINITIONS

- .1 Hot Work defined as:
 - .1 Welding work.
 - .2 Cutting of materials by use of torch or other open flame devices.
 - .3 Grinding with equipment which produces sparks.

1.5 SUBMITTALS

- .1 Submit copy of Hot Work Procedures and sample of Hot Work permit to Departmental Representative for review, within 14 calendar days after contract award.
- .2 Submit in accordance with the Submittal Procedures - specified in Section 01 33 00.

1.6 FIRE SAFETY REQUIREMENTS

- .1 Implement and follow fire safety measures during Work. Comply with following:
 - .1 National Fire Code, (current).
 - .2 Fire Protection Standards FCC 301 and FCC 302.
 - .3 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in Section 01 35 29.
- .2 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.

1.7 HOT WORK AUTHORIZATION

- .1 Obtain Departmental Representative's written "Authorization to Proceed" before conducting any form of Hot work on site.
- .2 To obtain authorization submit to Departmental Representative:
 - .1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.
 - .2 Description of the type and frequency of Hot Work required.
 - .3 Sample Hot Work Permit to be used.
- .3 Upon review and confirmation that effective fire safety measures will be implemented during performance of hot work, Departmental Representative will provide authorization to proceed as follows:
 - .1 Issue one written "Authorization to Proceed" covering the entire project for duration of work or;
 - .2 Separate work, or segregate certain parts of work, into individual entities. Each entity

- requiring a separately written "Authorization to Proceed" from Departmental Representative. Follow Departmental Representative's directives in this regard.
- .4 Requirement for individual authorization based on:
 - .1 Nature or phasing of work;
 - .2 Risk to Facility operations;
 - .3 Quantity of various trades needing to perform hot work on project or;
 - .4 Other situation deemed necessary by Departmental Representative to ensure fire safety on premises.
 - .5 Do not perform any Hot Work until receipt of Departmental Representative's written "Authorization to Proceed" for that portion of work.
 - .6 In tenant occupied Facility, coordinate performance of Hot Work with Facility Manager through the Departmental Representative. When directed, perform Hot Work only during non-operative hours of Facility. Follow Departmental Representative's directives in this regard.

1.8 HOT WORK PROCEDURES

- .1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.
- .2 Procedures to include:
 - .1 Requirement to perform hazard assessment of site and immediate hot work area for each hot work event in accordance with Hazard Assessment and Safety Plan requirements of section 01 35 29.
 - .2 Use of a Hot Work Permit system for each hot work event.
 - .3 The step by step process of how to prepare and issue permit.
 - .4 Permit shall be issued by Contractor's site Superintendent, or other authorized person designated by Contractor, granting permission to worker or subcontractor to proceed with hot work.
 - .5 Maintain a fire extinguisher in the immediate area where hot work is being undertaken.
 - .6 Provision of a designated person to carryout a Fire Safety Watch for a minimum of 2 hours immediately upon completion of the hot work.
 - .7 Compliance with fire safety codes and standards specified herein and Occupational Health and Safety regulations specified in Section 01 35 29.
- .3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Clearly label as being the Hot Work Procedures applicable to this contract.
- .4 Hot Work Procedures shall clearly establish worker instructions and allocate responsibilities of:
 - .1 Worker(s),
 - .2 Authorized person issuing the Hot Work Permit,
 - .3 Fire Safety Watcher,
 - .4 Subcontractors and Contractor.
- .5 Brief all workers and Subcontractors on Hot Work Procedures and Permit system established for project. Stringently enforce compliance.
 - .1 Failure to comply with the established procedures may result in the issuance of a Non-Compliance Notification at Departmental Representative's discretion with possible disciplinary measures imposed as specified in Section 01 35 29.

1.9 HOT WORK PERMIT

- .1 Hot Work Permit to include, as a minimum, the following data:
 - .1 Project name and project number;
 - .2 Building name, address and specific room or area where hot work will be performed;
 - .3 Date when permit issued
 - .4 Description of hot work type to be performed;
 - .5 Special precautions required, including type of fire extinguisher needed;
 - .6 Name and signature of person authorized to issue the permit.
 - .7 Name of worker (clearly printed) to which the permit is being issued.
 - .8 Time Duration that permit is valid (not to exceed 8 hours). Indicate start time & date and completion time & date.

- .9 Worker signature with date and time upon hot work termination.
- .10 Specified time period requiring safety watch.
- .11 Name and signature of designated Fire Safety Watcher, complete with time & date when safety watch terminated, certifying that surrounding area was under his continual surveillance and inspection during the full watch time period specified in Permit and commenced immediately upon completion of Hot Work.
- .2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.
- .3 Each Hot Work Permit to be completed in full and signed as follows:
 - .1 Authorized person issuing Permit before hot work commences;
 - .2 Worker upon completion of Hot Work;
 - .3 Fire Safety Watcher upon termination of safety watch;
 - .4 Returned to Contractor's Site Superintendent for safe keeping.

1.10 FIRE PROTECTION AND ALARM SYSTEMS

- .1 Fire protection and alarm systems shall not be:
 - .1 Obstructed.
 - .2 Shut-off, unless approved by Departmental Representative.
 - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than fire fighting.
- .3 Costs incurred, from the fire department, Facility owner and tenants, resulting from negligently setting off false alarms will be charged to the Contractor in the form of financial progress payment reductions and holdback assessments against the Contract.

1.11 DOCUMENTS ON SITE

- .1 Keep Hot Work Permits and Hazard assessment documentation on site for duration of Work.
- .2 Upon request, make available to Departmental Representative or to authorized safety representative for inspection.

End of Section

1 General

1.1 SECTION INCLUDES

- .1 Procedures to isolate and lockout electrical facility or other equipment from energy source.

1.2 RELATED WORK

- .1 Section 01 35 29: Health and Safety Procedures.
- .2 Section 01 35 24: Special Procedures on Fire Safety Procedures.

1.3 REFERENCES

- .1 CSA C22.1-2002 - Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
- .2 CSA C22.3 No. 1-M87 (R2001) - Overhead Systems.
- .3 CSA C22.3 No. 7-94 (R2000) - Underground Systems.
- .4 COSH, Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

1.4 DEFINITIONS

- .1 Electrical Facility: means any system, equipment, device, apparatus, wiring, conductor, assembly or part thereof that is used for the generation, transformation, transmission, distribution, storage, control, measurement or utilization of electrical energy, and that has an amperage and voltage that is dangerous to persons.
- .2 Guarantee of Isolation: means a guarantee by a competent person in control or in charge that a particular facility or equipment is isolated.
- .3 De-energize: in the electrical sense, that a piece of equipment is isolated and grounded, e.g. if the equipment is not grounded, it cannot be considered de-energized (DEAD).
- .4 Guarded: means that an equipment or facility is covered, shielded, fenced, enclosed, inaccessible by location, or otherwise protected in a manner that, to the extent that is reasonably practicable, will prevent or reduce danger to any person who might touch or go near such item.
- .5 Isolate: means that an electrical facility, mechanical equipment or machinery is separated or disconnected from every source of electrical, mechanical, hydraulic, pneumatic or other kind of energy that is capable of making it dangerous.
- .6 Live/alive: means that an electrical facility produces, contains, stores or is electrically connected to a source of alternating or direct current of an amperage and voltage that is dangerous or contains any hydraulic, pneumatic or other kind of energy that is capable of making the facility dangerous to persons.

1.5 COMPLIANCE REQUIREMENTS

- .1 Perform lockouts in compliance with:
 - .1 Canadian Electrical Code
 - .2 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in section 01 35 29.
 - .3 Regulations and code of practice as applicable to mechanical equipment or other machinery being de-energized.
 - .4 Procedures specified herein.
- .2 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.

1.6 SUBMITTALS

- .1 Submit copy of proposed Lockout Procedures and sample form of lockout permit or lockout tags for review.
- .2 Submit documentation within 7 calendar days of contract award. Do not proceed with work until

- .3 submittal has been reviewed by Departmental Representative.
Submit above documents in accordance with the Submittal Procedures specified in Section 01 33 00.
- .4 Resubmit Lockout Procedures with noted revisions as may result from Departmental Representative's review.

1.7 ISOLATION OF EXISTING SERVICES

- .1 Obtain Departmental Representative's written authorization prior to conducting work on an existing active, energized service or facility required as part of the work and before proceeding with lockout of such services or facility.
- .2 To obtain authorization, submit to Departmental Representative following documentation:
 - .1 Written Request for Isolation of the service or facility and;
 - .2 Copy of Contractor's Lockout Procedures.
- .3 Make a Request for Isolation for each event, unless directed otherwise by Departmental Representative, and as follows:
 - .1 Fill-out standard forms in current use at the Facility when so directed by Departmental Representative or;
 - .2 Where no form exist at Facility, make request in writing identifying:
 - .1 Identification of system or equipment to be isolated, including it's location;
 - .2 Time duration, indicating Start time & date and Completion time & date when isolation will be in effect.
 - .3 Voltage of service feed to system or equipment being isolated.
 - .4 Name of person making the request.
 - .3 Document to be in typewritten format.
- .4 Do not proceed until receipt of written notification from Departmental Representative granting the Isolation Request and authorization to proceed with the isolation of designated equipment or facility. Departmental Representative may designate other individual at the Facility as the person authorized to grant the Isolation Request.
- .5 Conduct safe, orderly shut down of equipment or facilities, de-energize and isolate power and other sources of energy and lockout items in accordance with requirement of clause 1.8 below.
- .6 Plan and schedule shut down of existing services in consultation with the Departmental Representative and the Facility Manager. Minimize impact and downtime of facility operations.
- .7 Determine in advance, as much as possible, in cooperation with the Departmental Representative, the type and frequency of situations which will require a Request for Isolation. Follow Departmental Representative's directives in this regard.
- .8 Conduct hazard assessment as part of the planning process of isolating existing equipment and facilities. Hazard Assessments to conform with requirements of Health and Safety Section 01 35 29.

1.8 LOCKOUTS

- .1 Isolate and lockout electrical facilities, mechanical equipment and machinery from all potential energy sources prior to starting work on such items.
- .2 Develop and implement lockout procedures to be followed on site as an integral part of the Work.
- .3 Use energy isolation lockout devices specifically designed and appropriate for type of facility or equipment being locked out.
- .4 Use industry standard lockout tags.
- .5 Provide appropriate safety grounding and guards as required.
- .6 Prepare Lockout Procedures in writing. Describe safe work practices, work functions and sequence of activities to be followed on site to safely isolate all potential energy sources and lockout/tagout facilities and equipment.
- .7 Include within procedures a system of worker request and issuance of individual lockout permit by a person, employed by Contractor, designated to be "in-charge" and being responsible for:
 - .1 Controlling issuance of permits or tags to workers.
 - .2 Determining permit duration.
 - .3 Maintaining record of permits and tags issued.
 - .4 Submitting a Request for Isolation to Departmental Representative when required in

- accordance with Clause 1.7 above.
- .5 Designating a Safety Watcher, when one is required based on type of work.
- .6 Ensuring equipment or facility has been properly isolated, providing a Guarantee of Isolation to worker(s) prior to proceeding with work.
- .7 Collecting and safekeeping lockout tags, returned by workers, as a record of the event.
- .8 Clearly establish, describe and allocate, within procedures, the responsibilities of:
 - .1 Workers.
 - .2 Designated person controlling issuance of lockout tags/permits.
 - .3 Safety Watcher.
 - .4 Subcontractors and General Contractor.
- .9 Procedures shall meet the requirements of Codes and Regulations specified in clause 1.5 above.
- .10 Generic procedures, if used, must be edited, supplemented with pertinent information and tailored to reflect specific project conditions. Clearly label as being the procedures applicable to this contract.
 - .1 Incorporate site specific rules and procedures established by Facility Manager and in force at site. Obtain such procedures through Departmental Representative.
- .11 Procedures to be in typewritten format.
- .12 Submit copy of Lockout Procedures to Departmental Representative, in accordance with submittal requirements of clause 1.6 herein, prior to commencement of work.

1.9 CONFORMANCE

- .1 Ensure that lockout procedures, as established for project on site, are stringently followed. Enforce use and compliance by all workers.
- .2 Brief all persons working on electrical facilities, mechanical and other equipment fed by an energy source on requirements of this section.
- .3 Failure to perform lockouts in accordance with regulatory requirements or follow procedures specified herein may result in the issuance of a Non-Compliance Notification at Departmental Representative's discretion.

1.10 DOCUMENTS ON SITE

- .1 Post Lockout Procedures on site in common location for viewing by workers.
- .2 Keep copies of Request for Isolation submitted to Departmental Representative and lockout permits or tags issued to workers during the course of work for full project duration.
- .3 Upon request, make such data available to Departmental Representative or to authorized safety representative for inspection.
- .4 Retain Hot Work Permits and Hazard Assessments.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Nova Scotia
 - .1 Occupational Health and Safety Act, S.N.S 1996.

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Part 1: List of individual health risks and safety hazards identified by hazard assessments.
 - .2 Part 2: List specific measures to control or mitigate each hazard and risk identified in part one of Plan. State engineering controls, personal protective equipment and safe work practices to be used for work having identified hazards(s) or risk(s).
 - .3 Part 3: Emergency and Communications Measures as follows:
 - .1 Emergency Procedures: standard operating procedures, evacuation measures and emergency response implemented on site during an accident or incident. State step by step procedures, applicable to each identified hazard.
 - .2 Emergency Communications: list names and telephone numbers of officials, to be contacted if incident, accident or emergency situation occurs, including:
 - .3 General Contractor and all Subcontractors.
 - .4 Provincial Departments and resources from local emergency organizations, based on type of hazard, incident or accident which might occur and as stipulated in applicable laws and regulations.
 - .5 Contingency and emergency response plan and procedures addressing standard operating procedures specific to the project site, such as fuel spills and releases to be implemented during emergency situations. Coordinate plan with existing facility emergency response requirements and procedures provided by Departmental Representative. Plan and procedures to identify pre emergency planning, personnel roles, lines and of authority and communication, emergency recognition and prevention, safe distances and places of refuge, site security and control recommendation procedures, PPE and emergency equipment and procedures for reporting incidents to local, provincial and federal agencies.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative.
- .4 Submit copies of incident and accident reports.
- .5 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 2 days after receipt of comments from Departmental Representative.
- .6 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .7 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
- .8 Maintain Worker's Compensation Coverage for duration of contract. Submit Letter of Good Standing to Departmental Representative.

1.4 SITE CONTROL AND ACCESS

- .1 Control work site and entry points. Grant and allow entry to only workers and other persons so authorized. Immediately stop non-authorized persons from circulating within construction areas and remove from site.
- .2 Prior to gaining access to the site, all contractors, subcontractors and suppliers shall file with the General Contractor their proof of Workers Compensation coverage, proof of required Insurance and proof of contract. Upon request, proof of these documents will be provided to the Owner and Departmental Representative.
- .3 Delineate and isolate construction areas from other areas of site by use of appropriate means. Erect barricades, fences, hoarding and temporary lighting as required. See Section 01 50 00 for minimum type of barriers acceptable.
- .4 Erect signage at entry points and at other strategic locations around site, clearly identifying construction area(s) as being "off limits" to non-authorized persons. Signage must be professionally made.
- .5 Ensure persons granted access are fitted and wear appropriate personal protective equipment (PPE).

1.5 PROTECTION

- .1 Provide temporary facilities for protection and safe passage of building occupants, public pedestrian and vehicular traffic around and adjacent to work site.
- .2 Provide safety barricades, lights and signage on work site as required to provide a safe working environment for workers.

1.6 PERMITS

- .1 Obtain building permit related to project prior to commencement of Work.
- .2 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.
- .3 Post all permits on site. Submit copies to Departmental Representative.

1.7 FILING OF NOTICE

- .1 File Notice of Project and other Notices with Provincial authorities prior to commencement of Work.

1.8 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.
- .2 Perform on-going hazard assessments 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 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 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.
- .4 Contractor to conduct a hazard assessment in conjunction with the Owner's maintenance staff as part of the planning process including isolating existing equipment where applicable and identification of hidden services where anchoring is required. Hazard Assessments to conform with requirements of Health and Safety Section 01 35 29.
- .5 As part of Emergency Response Procedures, all spills and releases to be reported to the Canadian Coast Guard 24 Hour Emergency Response line (1-800-565-1633).

1.9 MEETINGS

- .1 Prior to commencement of work hold Health and Safety meeting. Have Contractor's Site Superintendent in attendance.
- .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 and;
 - .3 Changes in site and project conditions.
- .5 Record and post minutes of meetings. Make copies available to Departmental Representative upon request.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act, Occupational Health and Safety Act Regulations, Nova Scotia.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.
- .3 Provide Departmental Representative with Material Safety Data Sheets (MSDS).

1.11 WHMIS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of material safety data sheets acceptable to Labour Canada and Health and Welfare Canada and Provincial Department of Labour.
- .2 Submit WHMIS data sheets to Departmental Representative in accordance with Section 01 33 00 Submittal Procedures.
- .3 Maintain WHMIS information station and ensure designated personnel are trained in its use.
- .4 Submit copies of all Tool Box or Safety Meeting notes.
- .5 Submit copies of all Worksite Safety Inspections.

1.12 UNFORESEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, 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.

1.13 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-coordinator. Health and Safety Co-coordinator must:
 - .1 Have minimum 2 years site-related working experience specific to activities associated with Construction.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

1.14 CONSTRUCTION SAFETY MEASURES

- .1 Observe and enforce construction safety measures required by National Building Code, 2005 Part 8, Provincial Government, Worker's Compensation Board and municipal statutes and authorities.
- .2 In event of conflict between any provisions of above authorities the most stringent provision governs.
- .3 NS Occupational Health and Safety Act and regulations, guidelines and code practice, stipulate standard equipment applicable to construction sites such as protective clothing, safety hats and boots, gloves, eye protection.
- .4 Provide and maintain first aid equipment, supplied and medications appropriate to the work and its location in accordance with the First Aid Regulations. Obtain and implement recommendations from Occupational Health and Safety Division specific to the project work site.

1.15 FIRE SAFETY REQUIREMENTS

- .1 Comply with requirements of latest standard for Building Construction Operations issued by the Fire Commissioner of Canada and Fire Safety Regulations of Local Authority.

1.16 OVERLOADING

- .1 Ensure no part of work is subjected to a load that will endanger its safety or cause permanent deformation.

1.17 SCAFFOLDING

- .1 Design and construct scaffolding in accordance with CSA S269.2-M87 and maintain in a secure and safe manner.

1.18 WELDING AND CUTTING

- .1 Use noncombustible shields for electric and gas welding or cutting executed within two (2) metres of combustible material or in occupied space.
- .2 Place tanks supplying gases as close to work as possible. Fix in upright position, free from exposure to sun or high temperatures.
- .3 Locate fire extinguishing equipment near all welding and cutting operations.

1.19 TESTING AND MONITORING

- .1 Test and monitor for hazardous conditions, as required to demonstrate compliance with provincial regulations.
- .2 If multiple locations are being worked simultaneously, provide monitoring at all locations where work is being carried out, including providing additional monitoring instruments.

1.20 RECORD KEEPING

- .1 ALL activities associated with Health and Safety shall be recorded daily in a bound notebook. Include as a minimum; activity date, time, location of occurrence, mitigation action taken and results. Records shall be assessed by the Departmental Representative.

1.21 OPEN FLAMES, SPARKS, EXPLOSION PROTECTION

- .1 Keep open flames and sparks to minimum. When flame or sparks are required, follow proper procedures to prevent fire or explosion.

1.22 FIRE SAFETY

- .1 The Sub-Contractors are to participate on the Fire Safety Committee under the Joint Health and Safety Committee. The Fire Safety Committee under the direction of the Contractor is responsible for implementation and maintenance of the Construction Fire Safety Plan.
- .2 Construction Fire Safety Plan:
 - .1 The Construction Fire Safety Plan will include the following:
 - .1 Introduction of plan and purpose.
 - .2 Fire Safety Committee.

- .3 Terms of reference.
- .2 Committee composition.
- .3 Emergency Procedures.
- .4 Fire protection equipment:
 - .1 Building description:
- .5 Provisions for fire fighting:
 - .1 Portable extinguishers.
 - .2 Exits.
 - .3 Emergency Lighting.
 - .4 Reduced drawings.
- .6 Fire safety maintenance schedule:
 - .1 General.
 - .2 Maintenance levels.
 - .3 Skill categories.
 - .4 Frequency.
 - .5 Checklists.
- .7 Other information:
 - .1 Instruction on use of fire extinguishers.
 - .2 Emergency Fire Drill procedures.
- .3 Portable Fire Extinguishers:
 - .1 During construction, Contractor is to provide and maintain on the site at all times, ULC listed 25 lb ABC dry chemical type portable fire extinguishers.
- .4 Blockage of Roadways:
 - .1 The Fire Department shall be advised of any work that would impede fire apparatus response. This includes violation of minimum overhead clearance, as prescribed by the Fire Department, erecting of barricades and the digging of trenches.
- .5 Rubbish and Waste Materials:
 - .1 Rubbish and waste materials are to be kept to a minimum.
 - .2 The burning of rubbish is prohibited.
 - .3 Removal:
 - .1 All rubbish shall be removed from the work site at the end of the workday or shift or as directed by Departmental Representative.
 - .4 Storage:
 - .1 Extreme care is required where it is necessary to store oily waste in work areas to ensure maximum possible cleanliness and safety.
 - .2 Greasy or oily rags or materials subject to spontaneous ignition shall be deposited and kept in an approved receptacle and removed as required in 1.7.3.1.
- .6 Flammable Liquids:
 - .1 The handling, storage and use of flammable liquids are to be governed by the current National Fire Code of Canada.
 - .2 Flammable liquids such as gasoline, kerosene and naphtha may be kept for ready use in quantities not exceeding 45 liters provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable liquids exceeding 45 liters for work purposes, requires the permission of the Fire Department.
 - .3 Transfer of flammable liquids having a flash point below 38°C is prohibited within buildings.
 - .4 Transfer of flammable liquids shall not be carried out in the vicinity of open flames or any type of heat-producing devices.
 - .5 Flammable liquids having a flash point below 38°C, such as naphtha or gasoline, shall not be used as solvents or cleaning agents.
 - .6 Flammable waste liquids, for disposal, shall be stored in approved containers located in a safe ventilated area. Quantities are to be kept to minimum and the Fire Department is to be notified when disposal is required.
- .7 Fire Inspection:
 - .1 The Fire Department shall be allowed unrestricted access to the work site.
 - .2 The Contractor shall cooperate with the Fire Department during routine inspections of the work site.

- .3 The Contractor shall immediately remedy all unsafe fire situations observed by the Fire Department.

1.23 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.24 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 may stop Work if non-compliance of health and safety regulations is not corrected.

1.25 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative .

1.26 POWDER ACTUATED DEVICES

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

1.27 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

1.28 SITE SAFETY MEETINGS

- .1 An orientation meeting shall be held with all workers at the start-up of the work, with the presence of the Departmental Representative to review the Health and Safety aspects of the work.
- .2 An orientation meeting shall be held by the Contractor for each new worker on the site following the initial orientation meeting.
- .3 Attend Health and Safety meetings as directed by Departmental Representative.

1.29 HANDLING AND TRANSPORTATION OF DANGEROUS GOODS

- .1 Observe and enforce all measures required by the regulatory agencies including but not limited to Environment Canada, Nova Scotia Department of Environment, and Transport Canada.
- .2 Most current regulatory guidelines and Acts will apply to the work.
- .3 In case of any conflict, the more stringent requirements will apply.

1.30 OPEN EXCAVATIONS

- .1 If open foundations or demolition areas are to be left at the end of a work day, protective fencing must be placed around the entire perimeter to limit access by others. Fencing to be self-supporting, approved by the Department of Labour and the Construction Safety and Industrial Safety Regulations.

1.31 POTENTIAL HAZARDS

- .1 Hazards include, but are not limited to, toxic, flammable and explosion hazards associated with cleaning solvents.
- .2 The Contractor shall become familiar with all potential hazards associated with the work, and shall take necessary measures to avoid injury or damage of any kind.

1.32 HEALTH AND SAFETY PLAN

- .1 Prior to commencement of the work, submit to the Construction Manager a detailed Health and Safety Plan for review. The Health and Safety Plan shall comply with the provisions of this section, and shall illustrate the Contractor's knowledge and understanding of health and safety aspects of the work, the Contractor's intention to maintain a high level of safety on-site, and shall include, but not be limited to:
 - .1 Description of Work
 - .2 Description of Site-specific hazards:
 - .1 Physical
 - .2 Chemical
 - .3 Environmental
 - .3 Protective Equipment:
 - .1 Respiratory
 - .2 Contact
 - .4 Decontamination Procedures:
 - .1 Personal protective equipment (PPE)
 - .2 Equipment
 - .3 Infection Control personal protective equipment required by CSA Z317.13-03.
 - .5 Medical - Monitoring:
 - .1 Workers medical profile and suitability to work at the site.
 - .6 Air - Monitoring Procedures:
 - .1 Action levels
 - .2 Site monitoring
 - .3 Perimeter monitoring
 - .7 Emergency Procedures:
 - .1 Emergency Equipment
 - .2 Contingency Plans:
 - .1 Spill control
 - .2 Fire
 - .3 Ventilation
 - .4 Medical Emergency
 - .8 General Safety:
 - .1 Designation of site-safety officer
 - .2 Safety log
 - .3 Trenching, digging, excavations
 - .4 Storage of flammables, compressed gases
 - .5 Safety inspections
 - .9 Site Training:
 - .1 Initial hazard
 - .2 Daily safety
- .2 All workers shall be trained and be familiar with the Health and Safety Plan and the use of personal protective equipment and Emergency Response Procedures.

1.33 SITE SAFETY OFFICER

- .1 Each Trade Contractor shall appoint a responsible member of the work force as Site Safety Office (SSO). The selection of the SSO will be subject to the approval of the Departmental Representative, and changes shall be made as requested by the Departmental Representative. The SSO shall be responsible for ensuring that all provisions of the Health and Safety Plan and relevant legislation are implemented. The SSO shall ensure that all monitoring and testing, as specified and at the direction of the Departmental Representative, are conducted. The SSO shall maintain records of all readings that are taken by the Contractor report and any abnormal or dangerous situation to the Departmental Representative and the Municipality, after having implemented emergency measures, as required, work shall not continue or proceed until the situation has been rectified.
- .2 The SSO shall be authorized to act on behalf of the Contractor on all matters related to Health and Safety.

1.34 PERSONAL PROTECTIVE EQUIPMENT

- .1 Use personal protection equipment as required by Occupational Health and Safety Act.
- .2 Training of workers in the proper use, fitting, inspection and storage of personal protective equipment shall be done prior to use of the equipment.

1.35 SANITATION/DECONTAMINATION PRACTICES

- .1 After each use, all disposable protective equipment shall be collected in a dedicated container for disposal.
- .2 All respiratory equipment shall be decontaminated daily after use.
- .3 All tools, pumps and equipment used during cleanup should be dedicated to the handling of contaminants and labeled as such and thoroughly decontaminated at the completion of the project.
- .4 Contaminated work clothing shall not be worn outside of regulated areas.
- .5 Workers shall wash their hands and exposed skin before eating, drinking, smoking or using toilet facilities during work shift, and at the completion of a work shift.
- .6 Food, drink and tobacco products shall not be permitted in regulated areas.

1.36 WORK PRACTICES AND ENGINEERING CONTROLS

- .1 Access to work areas shall be regulated and limited to authorized persons. A daily roster shall be kept of persons entering such areas.
- .2 Handling Contaminants and General Work Practices.
 - .1 Transportation and handling of contaminants to meet applicable local, provincial and federal regulations.
 - .2 Emergency respiratory equipment shall be located in readily accessible locations which will remain minimally contaminated with contaminants in an emergency.
 - .3 Containers and systems shall be handled and opened with care. Approved protective clothing shall be worn by all employees engaged in regulated areas.
 - .4 All wastes and residues containing contaminants shall be collected in appropriate containers.
- .3 Confined or Enclosed Spaces
 - .1 Entry into confined or enclosed spaces, where there is limited egress, shall be controlled by a permit system. Permits shall be signed by an authorized representative of the employer and shall certify that appropriate measures have been taken to prevent adverse effects on the worker's health as a result of his or her entry into such space.
 - .2 Confined or enclosed spaces which have contained contaminants shall be thoroughly ventilated to assure an adequate supply of oxygen, tested for contaminants, and inspected for compliance with these requirements prior to each entry. Adequate ventilation shall be maintained while workers are in such spaces. Each individual entering such confined or enclosed space shall be furnished with appropriate personal protective equipment and clothing and be connected by a lifeline harness to standby worker stations outside of the space. The standby worker shall also be equipped for entry with approved personal protective equipment and clothing and have contact with a third person. The standby person shall maintain communication (visual, voice, signal line, telephone, radio, or other suitable means) with the employee inside the confined or enclosed space.
 - .3 Workers entering confined spaces and standby workers shall be trained at a recognized confined space training program.

1.37 RECORD KEEPING

- .1 ALL activities associated with Health and Safety shall be recorded daily in a bound notebook. Include as a minimum: activity date, time, location of occurrence, mitigation action taken and results. Records shall be assessed by the Departmental Representative.

1.38 SUSPENSION OF ACTIVITIES

- .1 Exposure to contaminants shall be controlled so that no worker is exposed to contaminants at a concentration greater than the Time Weighted Average (TWA) concentration for the contaminant, for up to a 10 hour workday, 40 hour work week.
- .2 The Contractor will halt activities immediately during unsafe conditions. All costs relating to suspension of work for Contractor's failure to maintain Health and Safety procedures shall be borne by the Contractor.

1.39 CONTINGENCY AND EMERGENCY RESPONSE

- .1 As identified in required submittals.
- .2 Arrange and attend coordination meeting. Meeting will identify roles, responsibilities and actions to be taken in the event of an emergency or incident.

End of Section

1 General

1.1 FIRES

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

1.2 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.3 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.4 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Protect roots of designated trees to drip line during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Departmental Representative.
- .6 Contractor will conduct a walk of the site with Departmental Representative to identify all vegetation that is not to be disturbed by on site activities. Measures shall be taken for identifying and protecting.

1.5 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 Design and construct temporary crossings to minimize erosion to waterways.

1.6 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .5 Any spills and releases to be reported to the Canadian Coast Guard 24 Hour Emergency Response Line (1-800-565-1633).
- .6 The Contractor is to prevent hydrocarbon product releases in and around the project area.

1.7 SMOKING RESTRICTIONS

- .1 Smoking is not permitted inside the building at any time or at any stage of construction.

1.8 MIGRATORY BIRDS

- .1 All work to be conducted in accordance with the Migratory Birds Convention Act, which outlines that no migratory bird nests or eggs will be moved or obstructed during the construction or operational phase of the project.
- .2 Proponents and Contractors should ensure that food scraps and garbage are not left at the project site.
- .3 Avoid disturbances to all birds in and near the project area.
- .4 Task lighting, as well as lighting for the safety of the employee, should be shielded to shine down and only where it is needed, without compromising safety.

1.9 EROSION CONTROL

- .1 The exposed soil area must be minimized by limiting the area that is exposed at one time and by limiting the time that any one area is exposed. All stockpiled soil must be covered and/or dyked to prevent erosion and release of sediment laden water. Wherever possible, exposed soils must be stabilized.
- .2 Work should be scheduled to avoid periods of heavy precipitation. Erosion control structures (temporary matting, geotextile filter fabric) area to be used, as appropriate, to prevent erosion and release of sediment and/or sediment laden water during the construction phase. These structures are to be left in place until vegetation is re-established and/or all exposed soils are stabilized.

End of Section

1 General

1.1 INSPECTION

- .1 Give a minimum of 48 hour notice requesting inspection of work designated for special tests, inspections or approvals by Departmental Representative or by inspection authorities having jurisdiction.
- .2 In accordance with the General Conditions, Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents.
- .3 If Contractor covers or permits to be covered Work designated for special tests, inspections or approvals before such is made, uncover Work until particular inspections or tests have been fully and satisfactorily completed and until such time as Departmental Representative gives permission to proceed.
- .4 Pay costs to uncover and make good work disturbed by inspections and tests.

1.2 TESTING

- .1 Tests on materials, equipment and building systems as specified in various sections of the Specifications is the responsibility of the Contractor except where stipulated otherwise.
 - .1 Provide all necessary instruments, equipment and qualified personnel to perform tests.
- .2 At completion of tests, turn over 2 sets of fully documented tests reports to the Departmental Representative. Submit in accordance with Section 01 33 00.
 - .1 Obtain additional copies for inclusion of a complete set in each of the maintenance manuals specified in Section [01 78 00].
- .3 Unspecified tests may also be made by Departmental Representative, at the discretion of the Departmental Representative. The costs of these tests will be paid for by the Departmental Representative.
- .4 Where tests or inspections reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests and inspections incurred by Departmental Representative as required to verify acceptability of corrected work.

1.3 REJECTED WORK

- .1 Remove and replace defective Work, whether result of poor workmanship, use of defective or damaged products and whether incorporated in Work or not, which has been identified by Departmental Representative as failing to conform to Contract Documents.
- .2 Make good damages to [new] [and] [existing] construction and finishes resulting from removal or replacement of defective work.

End of Section

1 General

1.1 SITE ACCESS AND PARKING

- .1 The Departmental Representative will designate Contractor's access to project site as well as parking facilities for equipment.
- .2 Parking facilities at site is limited and cannot be used by Contractor. Make arrangements elsewhere for Contractor's vehicles including those of subcontractors and workers.
- .3 The Contractor will maintain all roads and sidewalks free from mud and debris tracked from construction site, on a daily basis, at no cost to Owner.
- .4 The Owner will provide snow removal within the site fence during period of work as required to maintain access to building, at no cost to the Contractor.
- .5 The Contractor will provide and maintain signs, barricades and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work, at no cost.

1.2 PARKING

- .1 Parking space for workers' vehicles will be available on site under the Contractor's control.
- .2 Parking for delivery and service vehicles for the supply and removal of construction materials and debris will be restricted to within the limit of contract and security fencing.

1.3 BUILDING ACCESS

- .1 Use only access doors, and circulation routes and elevators within building as designated by Departmental Representative to access interior work.

1.4 CONTRACTOR'S SITE OFFICE

- .1 Be responsible for and provide own site office, including electricity, heat, lights and communications as listed below. Locate site office as directed by Departmental Representative.
- .2 Contractor's site office **must** be located within the limits of the contract. This area will also be the location for the site offices for all subcontractors.

1.5 STORAGE SHEDS

- .1 Provide adequate weather tight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.
- .2 Provide heat when materials being stored are subject to frost damage.
- .3 Under no circumstances will Departmental Representative accept materials damaged due to exposure to weather elements, for incorporation into construction. Departmental Representative will determine what constitutes damaged material.
- .4 All storage sheds or trailers **must** be located within the limits of the contract and/or temporary construction fence.

1.6 LAYOUT

- .1 The Contractor will provide a bench mark and control grid.
- .2 Contractor shall be responsible for detailed setting out of his work.

1.7 MATERIAL STORAGE

- .1 Locate site storage trailers where directed by Departmental Representative. Place in location of least interference with existing facility operations.
- .2 Material storage space on site is limited. Coordinate delivery to minimize storage period on site before being needed for incorporation into work.

1.8 REMOVAL OF TEMPORARY FACILITIES

- .1 Remove temporary facilities from site when directed by Departmental Representative.

1.9 WASTE REMOVAL

- .1 The Contractor will provide bins as required. Contractor responsible for placement and sorting of waste in the collection bins and removal of waste from site.

End of Section

1 General

1.1 GENERAL

- .1 Use new material and equipment unless otherwise specified.
- .2 Within 7 days of written request by Departmental Representative, submit following information for materials and products proposed for supply:
 - .1 Name and address of manufacturer.
 - .2 Trade name, model and catalog number.
 - .3 Performance, descriptive and test data.
 - .4 Manufacturer's installation or application instructions.
 - .5 Evidence of arrangements to procure.
- .3 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.

1.2 REFERENCE STANDARDS

- .1 Conform to reference standards, in whole or in part as specifically requested in specifications.
- .2 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .3 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

1.3 CONFORMANCE

- .1 When material or equipment is specified by standard or performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.4 QUALITY OF PRODUCTS

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.5 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.6 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.7 TRANSPORTATION

- .1 Pay costs of transportation and handling of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Owner. Contractor to unload, handle and store such products.

1.8 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber and on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.9 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.10 CO-ORDINATION

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.11 FASTENINGS - GENERAL

- .1 Provide metal fastenings and accessories in same texture, color and finish as base metal in which they occur.
- .2 Prevent electrolytic action between dissimilar metals.
- .3 Use non-corrosive fasteners, anchors and spacers for securing exterior work.
- .4 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood plugs not acceptable.
- .5 Keep exposed fastenings to minimum, space evenly and lay out neatly.

- .6 Fastenings which cause spalling or cracking are not acceptable.
- .7 Obtain Departmental Representative's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166-1975, and observe restrictions in Section 01 35 29 - Health and Safety Procedures.

1.12 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur and resilient washers with stainless steel.

1.13 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

1.14 CONCEALMENT

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.15 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.16 CONSTRUCTION EQUIPMENT AND PLANT

- .1 On request, prove to the satisfaction of Departmental Representative that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.
- .2 Maintain construction equipment and plant in good operating order.

End of Section

1 General

1.1 RELATED SECTION

- .1 Section 01 77 00 - Closeout Procedures.
- .2 All sections

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove all waste materials from site at regular scheduled times and dispose of outside of the National Park boundaries. Disposal of waste to meet all local, provincial and federal regulations.
- .3 Clear snow and ice from access to construction, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use clearly marked separate bins.
- .7 Remove waste and debris from site and deposit in waste container at end of each working day.
- .8 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 CLEANING DURING CONSTRUCTION

- .1 Maintain work site in a tidy condition, free from accumulations of waste material and debris. Clean areas on a daily basis.
- .2 Keep existing building entrances, corridors and stairwells used by workers in clean dust free condition at all times. Conduct thorough cleaning of these areas at end of each work shift.
- .3 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .4 Provide and employ dust barriers, dividers, seals on doors and other dust control measures as required to ensure dust and dirt generated by work are not transmitted to other existing areas of building. Should dust accidentally migrate into areas under use by building occupants or public, employ such means as may be necessary to immediately clean all contaminated surfaces within these area(s) to the satisfaction of the Departmental Representative.
- .5 Immediately clean all dust, dirt, smears, scuffs and soiled surfaces in lobbies, corridors, stairwells and within tenant occupied areas resulting from use by workers.
 - .1 Perform cleaning, dusting and washing operations, carpet vacuuming (including shampooing if deemed required by Departmental Representative) and floor washing as necessary to thoroughly clean all soiled surfaces.

1.4 FINAL CLEANING

- .1 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .2 Remove waste products and debris.
- .3 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .4 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors and.
- .5 Clean lighting reflectors, lenses, and other lighting surfaces.
- .6 Vacuum clean and dust building interiors, behind grilles, louvers and screens.

- .7 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .9 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .10 Remove dirt and other disfiguration from exterior surfaces.
- .11 Clean and sweep roofs, gutters, area ways, and sunken wells.
- .12 Sweep and wash clean paved areas.
- .13 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
- .14 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .15 Remove snow and ice from access to construction.

End of Section

1 General

1.1 DEFINITIONS

- .1 Hazardous Material: Product, substance, or organism that is used for its original purpose, and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

1.2 WASTE MANAGEMENT

- .1 Incorporate environmental and sustainable practices in managing waste resulting from work.
- .2 Divert as much waste as possible from landfill.
- .3 Coordinate work of subtrades and subcontractors to ensure all possible waste reduction and recycling opportunities are taken. Follow waste management requirements specified in trade sections of the Specifications.
- .4 Reduce waste during installation of new materials. Undertake practices which will optimize full use of materials and minimize waste.
- .5 Develop innovative procedures to reduce quantity of waste generated by construction such as by delivering materials to site with minimal packaging etc...
- .6 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable and recyclable materials.
- .7 During demolition and removal work separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:
 - .1 Reinstallation into the work where indicated.
 - .2 Salvaging reusable items not needed in project which Contractor may sell to other parties.
 - .3 Sending as many items as possible to locally available recycling facility.
 - .4 Segregating remaining waste and debris into various individual waste categories for disposal in a "non-mixed state" as recommended by waste processing/landfill sites.
- .8 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/manufacturer.
- .9 Send leftover material resulting from installation work for recycling whenever possible.
- .10 Establish methods whereby hazardous and toxic materials, and their containers used on site are properly handled, stored and disposed in accordance with applicable federal, provincial and municipal laws and regulations.

1.3 DISPOSAL REQUIREMENTS

- .1 Burying or burning of rubbish and waste materials is prohibited.
- .2 Disposal of volatile materials, mineral spirits, oil, paint, and other hazardous materials into waterways, storm, or sanitary sewers is prohibited.
- .3 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.
- .4 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with provincial and municipal regulations.
- .5 Transport and dispose of waste intended for waste processing plant or landfill facility in separated condition and to Operator's rules and recommendations in support of their effort to recycle, reduce and divert certain waste stream from general landfill.
- .6 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.
- .7 Sale of salvaged items by Contractor to other parties not permitted on site.
- .8 Any construction or demolition debris, excavated soil material and impacted surface/ground water will be disposed of in a Provincially/Federally approved manner. Contractor to provide either a permit or receipt for tippage to Departmental Representative.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 01 78 00 - Closeout Submittals.
- .2 Section 01 91 13 - General Commissioning Requirements.

1.2 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an 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 that corrections have been made.
 - .2 Request Departmental Representative's Inspection.
- .2 Departmental Representative's Inspection: Departmental Representative, Owner and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and are fully operational.
 - .4 Systems have been commissioned
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for final inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Owner and Departmental Representative. If Work is deemed incomplete by Departmental Representative complete outstanding items and request re inspection.
- .5 Declaration of Substantial Performance: when Departmental Representative consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance. Refer to CCDC 2, General Conditions Article for specifics to application.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance shall 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: When Departmental Representative consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. Refer to CCDC 2. If Work is deemed incomplete by Owner, complete outstanding items and request re inspection. Cost of re inspection will be deducted from final payment.
- .8 Payment of Holdback: After issuance of Certificate of Substantial Performance of Work, submit an application of payment of holdback amount in accordance with CCDC2.

1.3 CERTIFICATE OF SUBSTANTIAL PERFORMANCE

- .1 Upon approval, a Certificate of Substantial Performance will be issued to the Owner by the Departmental Representative with a copy delivered to the Contractor.
- .2 The Certificate of Substantial Performance will establish the date of the Departmental Representative's inspection as the date of Substantial Performance of the Contract, and will commence the required 60-day period before release of the lien holdback amount.
- .3 During the 60-day period, Contractor shall continue to complete the work.
- .4 The Contractor shall immediately deliver to the Departmental Representative specified submissions upon receipt of the Certificate of Substantial Performance.

1.4 ESTABLISHMENT OF WARRANTIES

- .1 Warranties shall commence at date of Substantial Performance of the Work.

1.5 TOTAL PERFORMANCE

- .1 The Contractor shall inspect the work to establish its completion in accordance with the Contract Documents and when satisfied of this completion request of the Departmental Representative a final inspection.
- .2 The Departmental Representative will compile a final deficiency list at this inspection and issue it to the Contractor and Owner.
- .3 The Contractor shall correct final deficiencies before a date agreed upon by the Contractor and Departmental Representative.
- .4 When the Contractor has satisfied himself that these corrections have been completed in a satisfactory manner by his inspection, he shall schedule a re-inspection by the Departmental Representative, and the Owner's representatives if required, within five working days of the Contractor's request.
- .5 When the Departmental Representative is satisfied that all deficiencies have been rectified and the work is complete, the Contractor shall submit an application for the final progress payment.
- .6 When "seasonal deficiencies", as determined by the Owner and/or Departmental Representative exist, a sum of money will be withheld in accordance with the requirements of CCDC2-GC5.8.

1.6 WARRANTY PERIOD

- .1 The Owner will advise the Departmental Representative of defects observed during Warranty periods.
- .2 The Departmental Representative will notify the Contractor of these defects and request him to remedy the defects in accordance with the Contract Documents.
- .3 Thirty days before expiration of Warranties the Owner's representatives, the Departmental Representative and the Contractor will review the work as arranged by the Contractor noting defects of products and workmanship.
- .4 The Contractor shall immediately remedy such noted defects.

End of Section

1 General

1.1 SECTION INCLUDES

- .1 Project Record Documents as follows:
 - .1 As-built drawings;
 - .2 As-built specifications;
 - .3 Reviewed shop drawings.
- .2 Operations and Maintenance data as follows:
 - .1 Operations and Maintenance Manual;
 - .2 Maintenance Materials;
 - .3 Spare Parts;
 - .4 Special Tools.

1.2 RELATED SECTIONS

- .1 Section 01 45 00 - Testing and Quality Control.
- .2 Section 01 77 00 - Closeout Procedures.
- .3 Section 01 91 13 - General Commissioning Requirements.

1.3 PROJECT RECORD DOCUMENTS

- .1 Departmental Representative will provide two white print sets of contract drawings and two copies of Specifications Manual specifically for "as-built" purposes.
- .2 Maintain at site one set of the contract drawings and specifications to record actual as-built site conditions.
- .3 Maintain up-to-date, real time as-built drawings and specifications in good condition and make available for inspection by the Departmental Representative at any time during construction.
- .4 As-Built Drawings:
 - .1 Record changes in red ink on the prints. Mark only on one set of prints and at completion of project and prior to interim inspection, neatly transfer notations to second set (also by use of red ink). Submit both sets to Departmental Representative. All drawings of both sets shall be stamped "As-Built Drawings" and be signed and dated by Contractor.
 - .2 Show all modifications, substitutions and deviations from what is shown on the contract drawings or in specifications.
 - .3 Record following information:
 - .1 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure;
 - .2 Field changes of dimension and detail;
 - .3 Location of all capped or terminated services and utilities.
 - .4 Chases for mechanical, electrical and other services;
 - .5 Ceiling and floor elevations;
 - .6 Reflected ceiling plan condition showing finished layout of all ceiling-mounted services and devices;
 - .7 Plumbing, heating, air conditioning and ventilation, sprinkler and electrical service installation locations; all to be dimensioned and referenced to building columns or load bearing walls;
 - .8 All design elevations, sections, floor plans and details dimensioned and marked-up to consistently report finished installation conditions;
 - .9 Any details produced in the course of the contract by the Departmental Representative to supplement or to change existing design drawings must also be marked-up and dimensioned to reflect final as-built conditions and appended to the as-built drawing document;
 - .10 All change orders issued over the course of the contract must be documented on the finished as-built documents, accurately and consistently depicting the changed condition as it applies to all affected drawing details.
- .5 As-built Specifications: legibly mark in red each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed,

- particularly items substituted from that specified.
- .2 Changes made by Addenda and Change Orders.
- .3 Mark up both copies of specifications; stamp "as-built", sign and date similarly to drawings as per above clause.
- .6 Maintain As-built documents current as the contract progresses. Departmental Representative will conduct reviews and inspections of the documents on a regular basis. Frequency of reviews will be subject to Departmental Representative's discretion. Failure to maintain as-builts current and complete to satisfaction of the Departmental Representative shall be subject to financial penalties in the form of progress payment reductions and holdback assessments.

1.4 REVIEWED SHOP DRAWINGS

- .1 Compile full set of shop drawings and product data reviewed on project and incorporate into Operations and Maintenance Manual. Supply number of shop drawing sets equal to the required number of final Operations and Maintenance manuals.
- .2 Submit shop drawing sets at same time and as part of the contents of the Operation and Maintenance manuals specified in this section.

1.5 OPERATIONS AND MAINTENANCE MANUALS

- .1 Definition: an organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of the specifications.
- .2 Manual Language: final manuals to be in English language.
- .3 Number of copies required:
 - .1 Submit 2 interim copies of the manual for review and inspection by Departmental Representative. Make revisions and additions as directed and resubmit.
 - .2 Upon review and acceptance by Departmental Representative, submit 3 final copies. Initial copies are not to be considered as part of the final copies unless they have been fully revised and are identical to the final approved version.
- .4 Submission Date: submit complete operation and maintenance manual to Departmental Representative 3 weeks prior to application for Interim Certificate of Completion of project.
- .5 Binding:
 - .1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
 - .2 Use vinyl, hard covered, 3 "D" ring binders, loose leaf, sized for 215 x 280 mm paper, with spine pocket.
 - .3 Where multiple binders are needed, correlate data into related consistent groupings.
 - .4 Identify contents of each binder on spine.
 - .5 Organize and divide data into sections same as 16 division numerical order of contract specifications and thereafter subdivided into various equipment or building systems.
 - .6 Material: separate each section by use of cardboard dividers and labels. Provide tabbed fly leaf for each separate product or system within each section and with typed description of product and major component parts of equipment.
 - .7 Type lists and notes. Do not hand write.
 - .8 Drawings, diagrams and manufacturers' literature must be legible. Provide with reinforced, punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .6 Manual Contents:
 - .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location and project number.
 - .3 Names and addresses of Contractor, and all Sub-contractors.
 - .2 Table of Contents: provide full table of contents in each binder(s), clearly indicate which contents are in each binder.
 - .3 List of maintenance materials.
 - .4 List of spare parts.
 - .5 List of special tools.
 - .6 Original or certified copy of Warranties and Guarantees.

- .7 Copies of approvals, and certificates issued by Inspection Authorities.
- .8 Copies of reports and results from tests designated as Contractor's responsibilities.
- .9 Product Information Data on all materials, equipment and systems as specified in individual sections of the specifications to include:
 - .1 List of equipment including manufacturer's name, supplier, local source of supplies and service depot(s). Provide full addresses and telephone numbers.
 - .2 Nameplate information including equipment number, make, size, capacity, model number and serial number.
 - .3 Parts list.
 - .4 Installation details.
 - .5 Operating instructions.
 - .6 Maintenance instructions for equipment.
 - .7 Maintenance instructions for finishes.
- .7 Shop drawings:
 - .1 Bind one complete set of reviewed shop drawings into each copy of operations and maintenance manual.
 - .2 Bind the shop drawings in a manner such that they correspond with the specification section they relate to.
 - .3 Where large quantity of data is supplied due to size of project, fold and bind professionally into separate correctly sized binder.
- .8 Equipment and Systems Data: the following list indicates the type of data and extent of information required to be included for each item of equipment and for each system:
 - .1 Description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
 - .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
 - .3 Include installed color coded wiring diagrams.
 - .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - .6 Servicing and lubrication schedule, and list of lubricants required.
 - .7 Manufacturer's printed operation and maintenance instructions.
 - .8 Sequence of operation by controls manufacturer.
 - .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - .10 Provide installed control diagrams by controls manufacturer.
 - .11 Provide Contractor's coordination drawings, with installed color coded piping diagrams.
 - .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - .14 Include test and balancing reports.
 - .15 Additional requirements as specified in individual specification sections.
- .9 Materials and Finishes Maintenance Data:
 - .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and color and texture designations.
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .4 Additional Requirements: as specified in individual specifications sections.

1.6 SUBMISSION

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Departmental Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 **Two weeks prior to Substantial Performance of the Work**, submit to the Departmental Representative, three final copies of operating and maintenance manuals in English.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.
- .9 Failure to deliver maintenance materials, spare parts, special tools and as-builts will delay progress payments.

1.7 FORMAT

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

1.8 CONTENTS - EACH VOLUME

- .1 Table of Contents: 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 clearly 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. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Testing and Quality Control.

1.9 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on 2 sets of blue line opaque drawings, and in copy of Project Manual.
- .2 Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .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.
- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, required by individual specifications sections.

1.10 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed color coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed color coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Testing and Quality Control and 01 91 13 General Commissioning Requirements.
- .15 Additional requirements: As specified in individual specification sections.

1.11 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.12 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalog all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.
- .6 **Failure to deliver maintenance materials, special tools and spare parts at Substantial Performance WILL Delay Progress Payments.**

1.13 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalog all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.14 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to site; place and store.
- .4 Receive and catalog all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.15 STORAGE, HANDLING AND PROTECTION

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

1.16 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by Subcontractors, suppliers, and manufacturers where specifically requested by individual specification sections, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Operations and Maintenance Manual: Section [01 78 00].

1.2 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel prior to date of final inspection.
- .2 Departmental Representative will provide a list of Owner's personnel to receive instructions,
- .3 Cooperate with Departmental Representative in coordinating time and attendance of Owner's personnel with manufacturer's training Representative(s).

1.3 QUALITY CONTROL

- .1 Ensure that only personnel from own forces, Subcontractors or Suppliers competent and fully knowledgeable in the particular material component, equipment or system installation are used to provide training and demonstrations.
- .2 When specified in individual Sections, obtain the manufacturers authorized Representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.
- .3 Upon request, provide evidence to Departmental Representative of individual Trainer's knowledge and qualifications.

1.4 SUBMITTALS

- .1 Submit schedule of time, date and complete list of equipment and systems for which demonstration and training sessions will be provided. Submit schedule a minimum of [2] weeks prior to designated dates, for Departmental Representative's approval.
- .2 Submit report within [1] week after completion of demonstration, that demonstration and instructions have been satisfactorily completed. Provide time and date of when each demonstration was actually given, with list of persons present.

1.5 CONDITIONS FOR DEMONSTRATIONS

- .1 Prior to carrying out demonstration and training, ensure that equipment has been inspected and tested, is fully operational, has been performance verified and TAB has been carried out.
- .2 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.6 PREPARATION

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.

1.7 DEMONSTRATION AND INSTRUCTIONS

- .1 Include the following items within the demonstration and training:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each of equipment.
 - .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
 - .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.
 - .5 Provide other specific training and instructions as specified in trade sections.

1.8 TIME ALLOCATED FOR INSTRUCTIONS

- .1 Observe the allocated time period specified in trade sections. Provide additional time when required to ensure all personnel fully understand all aspects of the information and instructions being provided. Allow for questions by participants.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 01 78 00 - Closeout Submittals

1.2 COMMISSIONING OBJECTIVE

- .1 Perform commissioning activities in order to achieve the following objectives:
 - .1 Collect data on equipment and systems supplied; and to document their installation;
 - .2 Conduct checks and tests on fully installed building component, equipment, systems and integrated systems to:
 - .1 Verify whether they operate in accordance with requirements of Contract Documents;
 - .2 Verify performance against design criteria and user requirements and measure peak capacities;
 - .3 Prepare a Building Management Manual (BMM) which contains operations and maintenance data, as-built record documents, commissioning reports, training data and other critical information for future use by Facility operational staff;
 - .4 Ensure transfer of knowledge on the operations, maintenance and management of the Facility to Owner and Operational personnel by means of appropriate training.
- .2 Commissioning activities conducted by Owner and/or Departmental Representative does not replace checks, tests, adjustments, balancing and other performance verification responsibilities to be performed by Trade Contractor as part of the work and as specified in other sections of the Specifications.

1.3 DEFINITIONS

- .1 For the purpose of this contract, the following terms, used in this section, as they relate directly or indirectly to the commissioning process, shall be deemed to have the meaning as defined hereafter.
- .2 Commissioning Process: a planned program of tasks, activities and procedures carried out systematically during the Construction and Occupancy Stages in accordance with the commissioning objectives, specified in clause 1.2 above, to:
 - .1 Verify whether the fully installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and;
 - .2 Ensure that appropriate documentation is compiled to effectively train Operation and Maintenance staff and prepare a comprehensive Building Management Manual (BMM).
- .3 Commission (ie: to commission a building component or system): tests and checks conducted on all systems and integrated systems of Facility; carried out only after they are fully installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.
 - .1 Contractor provides assistance during this process by operating equipment and systems, by troubleshooting and making adjustments as may be required.
 - .2 Systems are run under their full operation and under various modes to determine if they function correctly, consistently, at peak efficiency and interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .3 During these checks, adjustments may be made enhancing performance to meet environmental or user requirements.
- .4 Contractor: means the Contractor, however it also refers to any personnel from Subcontractors, including the controls subcontractors, suppliers and manufacturer representatives with whom the Contractor contracts or obtains services for the performance of work and designated commissioning duties.
- .5 Departmental Representative: persons from the civil, architectural, mechanical and electrical design disciplines of the consultant firm(s) engaged by Owner to prepare the final design and contract documents.
- .6 Design Criteria: All those factors included in the design of a Facility prescribed by the tenant needs or as determined by Departmental Representative as necessary in order to meet all Facility

- functional and user operational requirements
- .7 Installation/Start-up Checks:(sometimes referred to as pre-functional checks). Checks and inspections to be performed by Contractor during the pre-start-up and start-up of a particular equipment or system component.
 - .1 Checklist sheets are produced which include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks and;
 - .2 Special procedures as specified in relevant sections of Specifications;
 - .3 Other items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
 - .2 Standard Installation/Start-up Checklist sheets prepared by equipment manufacturer are acceptable for use. Supplement with additional data representative of specific project conditions as deemed required by Departmental Representative.
 - .3 Use Checklist sheets for all equipment installation. Document in writing on checklist the various checks made, deficiencies noted and corrective action taken.
 - .4 Installing Sub-Contractor to sign Checklist sheets upon completion, certifying that stated checks and inspections have been performed.
 - .8 Performance Verification: (sometimes referred to Functional Testing) checks, running dynamic tests and adjustments carried out by Contractor on equipment and systems, upon their installation, to ensure they operate correctly, efficiently and function independently and interactively with other systems as intended in accordance with contract documents and manufacturer's recommendations.
 - .1 Performance Verification shall not be considered part of the commissioning process. It is however considered an essential and integral part of Contractor's responsibilities in the equipment installation process which must be stringently conducted, successfully completed and approved by Owner before a piece of equipment or system is considered fully installed and functional.
 - .2 Facility components and systems will not be commissioned until performance verification has been completed and approved.
 - .9 Product Information (PI Data): a compilation of data gathered on a particular piece of equipment, typically produced by manufacturer, which includes nameplate information, installation/startup instructions, parts list, operating instructions, maintenance guidelines and other pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of such equipment. This documentation is included in the Building Management Manual(BMM) at completion of work.

1.4 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES

- .1 General:
 - .1 Coordinate the participation of the various subcontractors, their specialists and manufacturer's representatives in providing the commissioning activities described below.
 - .2 Ensure that workers and manufacturer's personnel are knowledgeable and qualified to interpret system functions and intended design criteria.
 - .3 Develop a commissioning schedule.
 - .4 Notify Departmental Representative in writing when Facility is ready for be commissioned. Give 14 calendar day notice.
 - .5 Commissioning of Facility and designated systems will only commence once that required documentation has been received and all installed equipment and systems have undergone successful performance verification.
 - .6 Be aware that inspection certificate will only be issued by Departmental Representative when:
 - .1 All commissioning documentation has been received, reviewed for suitability and approved by Departmental Representative;
 - .2 Designated facility components and systems have been commissioned and;
 - .3 Training has been completed.
 - .7 Non-Conformance of Performance Verification Requirements :
 - .1 Should incorrectly installed or malfunctioning equipment, system components or associated controls be found while Facility is being commissioned, Contractor shall be required to re-verify 100% of all equipment and components within the non

- functional system, including other related system as deemed required by Departmental Representative, to correct deficiencies and ensure effective performance.
- .2 Costs to correct work and any additional tests or inspections, as deemed required by Departmental Representative, to determine acceptability and proper performance of such items to be paid for by Contractor.
 - .1 Above costs held against Contractor will be as financial penalties in the form of progress payment reductions or holdback assessments.
 - .2 Prior to Facility being Commissioned:
 - .1 Submit commissioning documentation as specified in clause 1.8 for use during commissioning.
 - .2 Carryout pre-start-up and start-up of equipment.
 - .3 Conduct performance verification on all installed equipment and systems. Ensure they are fully functional.
 - .4 Address deficiencies in Work identified during performance verification of equipment and systems. Conduct additional performance verification checks and tests to ensure acceptability of Work.
 - .5 Arrange for special tools and devices, identified at commissioning meeting(s), as deemed required to assist with commissioning.
 - .6 Provide access ladders, two way radios and other equipment required by Team when facility will be commissioned.
 - .3 When Facility is being Commissioned:
 - .1 Provide qualified tradespersons to be present at site to assist commissioning activity.
 - .2 Assist in commissioning architectural and structural building component, and mechanical, electrical and civil systems specified and as follows:
 - .1 Operate designated building component, mechanical/electrical equipment and system under all modes of operation and conduct checks and tests as directed by Departmental Representative.
 - .2 Check and verify that building component, equipment, systems and integrated systems, including their controls, are functioning and responding correctly and interactively with each other.
 - .3 Test systems independently and then in unison with other related systems.
 - .4 Conduct all Commissioning checks and tests in presence of and witnessed by Departmental Representative.
 - .3 Specific procedures used to commission Facility may be provided by Departmental Representative which includes:
 - .1 Sequential order of building component and system to be tested.
 - .2 Running systems under various anticipated modes and demands (example: high and low cooling or heating loads, duplicating outside temperature conditions, fire alarm and power failure conditions etc...).
 - .3 Running building controls through all sequences of operation to verify and confirm that equipment and systems are responding as designed and intended.
 - .4 Operating designated equipment at peak capacities, recording output data against design criteria.
 - .4 Run component or systems as long as necessary to effectively commission all items as deemed required by Departmental Representative.
 - .5 Monitor equipment and system responses.
 - .6 Record test results, measurements and other data.
 - .7 Assist in analyzing results. Identify system deficiencies and components not responding as intended.
 - .8 Correct deficiencies and system non-conformance issues. Adjust, calibrate or fine tune system components as required. Debug system software as may be required.
 - .9 Retest systems when directed to confirm compliance.
 - .4 Upon completion of Facility Commissioning:
 - .1 Provide training to Maintenance & Operational personnel as specified in clause 1.7 below.
 - .2 Turn over any filled-in checks sheets or reports resulting from commissioning.
 - .3 If there are any deficiencies found during commissioning, provide documentation with

- details regarding the corrective action taken.
- .5 During Warranty period at Occupancy Stage:
 - .1 Fine tune components, systems and integrated systems and continue system debugging to optimize Facility performance.
 - .2 Rectify warranty issues.
 - .3 Submit written report to Departmental Representative.
 - .1 Indicate results noted and corrective action taken.
 - .2 Note improvements made to operating parameters and control settings.
 - .3 Recommend modifications deemed advisable to improve performance, environmental conditions, energy consumptions and other issues.
 - .4 Departmental Representative to be present during such work.

1.5 COMMISSIONING MEETINGS

- .1 Convene commissioning meetings following project meetings: as required through the project to coordinate commissioning requirements.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to commissioning .
- .3 Continue commissioning meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage. Contractor to call a separate commissioning scope meeting to review progress including consultant, discuss schedule of equipment start-up activities and prepare for commissioning . Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter commissioning meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Contractor, who will record and distribute minutes within 3 business days.
- .7 Ensure Subcontractors and relevant manufacturer representatives are present at subsequent commissioning meetings and as required.

1.6 COMMISSIONING SCHEDULE

- .1 Address commissioning activities within the construction work schedule. Clearly identify allocated time period for commissioning and training activities.
- .2 Provide a commissioning schedule at the 60% construction stage in order that specific issues and individual details of commissioning can be reviewed, discussed and dealt with from that period onward to project completion. Submit updates thereafter,
- .3 Indicate allocated time period and anticipated dates for:
 - .1 Submission of commissioning documentation, including O&M Manuals.
 - .2 Equipment and system start-up and performance verification, making them ready to be commissioned.
 - .3 Allocated period to commission designated building components and systems.
 - .4 Training period.
 - .5 Work during Warranty period.
- .4 Submit schedule to Construction Manager for review.

1.7 INSTRUCTORS

- .1 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and

- components.
- .2 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.8 TRAINING OBJECTIVES

- .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
- .2 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.9 TRAINING MATERIALS

- .1 Contractor to be responsible for content and quality.
- .2 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Management Manual.
 - .5 Testing, Adjusting and Balancing and Performance Verification Reports.
- .3 Training materials to be in a format that permits future training procedures to same degree of detail.
- .4 Supplement training materials:
 - .1 Transparencies for overhead projectors.
 - .2 Multimedia presentations.
 - .3 Manufacturer's training videos.
- .5 Equipment models.

1.10 RESPONSIBILITIES

- .1 Be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
- .2 Departmental Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.
 - .1 Report to include a list of all attendees.

1.11 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.
 - .8 Trouble-shooting diagnosis.
 - .9 Inter-Action among systems during integrated operation.

- .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.12 VIDEO-BASED TRAINING

- .1 Manufacturer's videotapes to be used as training tool with Departmental Representative's review and written approval 3 months prior to commencement of scheduled training.
- .2 On-Site training videos:
 - .1 Videotape training sessions for use during future training.
 - .2 To be performed after systems are fully commissioned.
 - .3 Organize into several short modules to permit incorporation of changes.
- .3 Production methods to be professional quality.

1.13 TRAINING

- .1 Commence process of familiarizing O&M personnel in the early stages of work on purpose and operation of various equipment and systems. Continue process throughout the entire construction duration.
 - .1 Provide informal briefings during occasional site visits, at planned commissioning meetings and during the final commissioning site activities.
- .2 Conduct formal demonstration and training sessions only after all identified systems have been commissioned and Departmental Representative has given approval to proceed with the training process.
- .3 Provide training and demonstration on equipment, sub-systems, systems and integrated systems.
- .4 Carryout training in accordance with requirements of Section 01 91 13 - General Commissioning Requirements.
- .5 Submit written agenda of training session(s) 4 weeks before hand for review by Departmental Representative.
- .6 Submit training manuals for review 2 weeks prior to actual training.
- .7 Ensure required tools and O&M Manuals are on site for training and system demonstration.
- .8 As a minimum, the training sessions to cover the following information:
 - .1 Introduction.
 - .2 Description of the system with factory personnel being involved at appropriate times.
 - .3 Instructions on start-up procedures including seasonal procedures, system check-lists and emergency procedures.
 - .4 Operational procedures, including occupancy considerations, seasonal change-over, manual and automatic operations and emergency modes.
 - .5 Instruction on system shutdowns, including checklists.
 - .6 Instructions on all aspects of system maintenance, including routine servicing, lubrication, overhaul and factory servicing.
 - .7 Information concerning the scope of warranties and their use.
 - .8 A description of spare parts in stock and their service.
 - .9 A description of normal tools required for servicing the systems/equipment.
- .9 Submit typewritten record of training sessions given and list of attendees. Use forms of format approved by Departmental Representative.

1.14 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.
- .2 Owner will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.15 QUALITY CONTROL

- .1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.
- .2 Obtain signature from attendees and provide a copy in the Building Maintenance Manual.

1.16 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Record signatures of all attendees.
- .5 Give time and date of each demonstration, with list of persons present.

1.17 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation in accordance with respective applicable Sections.
- .2 Testing, adjusting, and balancing has been performed and equipment and systems are fully operational.
- .3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.18 PREPARATIONS

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.

1.19 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, sequencing, winter/summer operating, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.20 COMMISSIONING DOCUMENTATION

- .1 Submit the following documentation for use during commissioning and for incorporation thereafter into a Building Management Manual (BMM):
 - .1 Operations and Maintenance Manuals, Project Record Documents and other data as specified in Section 01 78 00. Data to include:
 - .1 Equipment Product Information (PI Data) complete with:
 - .1 Nameplate info,
 - .2 Installation instructions,
 - .3 Operating procedures and
 - .4 Maintenance guidelines.
 - .2 Reviewed shop drawings,
 - .3 As-built record drawings and Specifications.
 - .2 Completed Installation/Start-up Checklist sheets used.
 - .3 Copy of any static and dynamic test and reports conducted.
 - .4 Reports as specified in various trade sections.
- .2 Documentation to include detailed information and number of copies as specified for maintenance manuals of section 01 78 00.

End of Section

1 General

1.1 DESCRIPTION OF WORK

- .1 Perform all demolition, and restitution as indicated and required to properly complete the work of the contract, as specified in this section and indicated on the drawings.
- .2 All demolition work will only be permitted to take place from Monday - Friday between 8:00 AM and 4:00 PM and all work shall be completed before May 15, 2015.
- .3 All mechanical and electrical work must be carry out by the Mechanical and Electrical subcontractors identify in Appendix A of the Tender Form.
- .4 All items indicated to be removed either for re-installation elsewhere under the Work of this Contract, or to be salvaged and turned over to the Owner are to be removed we care to avoid damage to the items. All damage to be made good the contractors expense.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 29 - Health and Safety Procedures.
- .3 Section 01 35 43 - Environmental Procedures.
- .4 Section 02 65 01 - Above Ground Storage Tank Removal.
- .5 Section 31 23 00 - Excavation and Fill

1.3 REFERENCES

- .1 Canadian Council of Ministers of the Environment (CCME).
 - .1 CCME PN 1299 Canadian Environmental Utility Guidelines.
 - .2 CCME PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for petroleum products and allied petroleum products.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA S350-M1980(R1998), Code of Practice for Safety in Demolition of Structures.
- .3 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .3 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .1 SOR/2008-197 storage tank systems for petroleum products and allied petroleum products regulation.
 - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
 - .5 Motor Vehicle Safety Act (MVSA)
 - .6 Workers Compensation Act
 - .7 National Building Code of Canada
- .4 Underwriters' Laboratories of Canada (ULC).
 - .1 ULC/ORD-C107.19-1992, Secondary Containment of Underground Piping.
 - .2 ULC/ORD-C58.15-1992, Overfill Protection Devices for Underground Tanks.
 - .3 ULC/ORD-C58.19-1992, Spill Containment Devices for Underground Tanks.

1.4 MECHANICAL AND ELECTRICAL SUBCONTRACT RESPONSIBILITIES

- .1 All Mechanical and Electrical work must carried out by the Mechanical and Electrical Subcontractors, except for related cutting and patching which is the responsibility this General Contractor.

1.5 REMOVED MATERIALS

- .1 All removed material, with the exception of items designated under Par. 1.6 Salvage become the property of the Contractor and are to be removed from the site in accordance with the requirements of paragraph 3.5 disposal.
- .2 Notwithstanding this requirement the Owner reserves the right to inspect all materials following removal and retain any item that the Owner deems useful for the Owner's future use. The Owner will be responsible for the removal of these materials from the site.

1.6 PROTECTION

- .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Take all necessary precautions and provide all bracing, shoring, and underpinning to support adjacent structures, structures undergoing demolition, adjacent services, roads and walks, landscaping and grading in accordance with section 31 23 00 - Excavation and Fill.
- .3 If during the demolition work a situation should develop or a condition be exposed which has the potential to endanger the safety of workers or other persons in the building or structure in which demolition work is being carried out, the Contractor will cease operations, take whatever emergency action in the Contractor's opinion is required to ensure the immediate safety of workers, other persons in the building or structure, and notified the Consultant before continuing to work.
- .4 Prevent debris from blocking, damaging or otherwise interfering with Mechanical and Electrical systems which must remain active and/or in place

1.7 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Where required by Authorities Having Jurisdiction, submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
- .3 Submit drawings stamped and signed by qualified Professional Engineer registered or licensed in Province of Nova Scotia, Canada, where complexity of work requires structural dis-assembly.

1.8 QUALITY ASSURANCE

- .1 Regulatory Requirements: Ensure Work is performed in compliance with CEPA.
- .2 Meetings:
 - .1 Prior to start of Work arrange for site visit with Consultant to examine existing site conditions adjacent to demolition work.
 - .2 Hold project meetings weekly.
 - .3 Ensure key personnel attend.

1.9 SAFETY CODE

- .1 Carry out demolition work in accordance with the requirements of the National Building Code of Canada, Part 8, the Provincial Occupational Health and Safety Act and regulations and/or other regulations having force of law.
- .2 In the case of conflict or discrepancy between regulations the more stringent requirements shall apply.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate for off site disposal waste material in accordance with Waste Management Plan.
- .2 Divert excess materials from landfill.
- .3 Dispose of waste at appropriate disposal facilities.

2 Products

2.1 NOT APPLICABLE

3 Execution

3.1 PREPARATION

- .1 Ensure the following work has been properly completed before beginning demolition and removal:
 - .1 Disconnect all Mechanical and Electrical services to be removed.
 - .2 Tag or otherwise mark all Mechanical and Electrical services that are to remain in operation in order to avoid removal of services required to remain and/or accidental

- interruption of service.
- .3 Services accidentally removed shall be replaced at the contractor's expense to the satisfaction of the Owner and the Consultant.
- .2 Tag or otherwise identify all items required to be salvaged to ensure that these items are removed with care to avoid damage.

3.2 DEMOLITION

- .1 At the end of each day's work, leave work in a safe and secure condition so that no part is in danger of toppling or falling or unlawful entry.
- .2 Demolish in a manner to minimize dusting. Keep dusty material wetted.
- .3 Environmental:
 - .1 Remove contaminated or dangerous materials as defined by authority having jurisdiction, relating to Environmental Protection, from site and dispose of in safe manner to minimize danger at site during disposal.
- .4 Prior to the start of any demolition work remove aboveground and underground storm storage tanks. Remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of at designated disposal facilities.

3.3 RESTITUTION

- .1 Repair/replace finish grade to match surrounding area. Provide sod to match existing.

3.4 DISPOSAL

- .1 All demolished materials except as noted for salvage become the property of the Contractor and are to be removed from the site and this is to be in a manner and in a location acceptable to the Provincial and Federal Authority governing such disposal. All materials must be disposed of outside of the National Park boundaries.
- .2 Pay all fees that may be charged to dispose of materials at licensed disposal sites.

End of Section

1 General

1.1 SECTION INCLUDES

- .1 Materials and procedures for the removal of Above Ground storage tanks.
- .2 The work included under this section consists of furnishing all labor, materials, services, equipment and apparatuses required to properly remove and dispose of existing fuel tanks and associated ancillary equipment.
- .3 Contractor is responsible for the removal of all liquids and sludges inside the tanks, including diesel fuel, gasoline, water, solids and/or sludge.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 29 - Health and Safety Procedures.
- .3 Section 31 23 00 - Excavation and Fill

1.3 REFERENCES

- .1 Canadian Council of Ministers of the Environment (CCME).
 - .1 CCME PN1326, Environmental Code of Practice for Above Ground and Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products.
 - .2 CCME PN1299-Latest Edition, Canadian Environmental Quality Guidelines.
 - .1 Chapter 7-Updated 2002, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.
- .2 Canadian Federal Legislation
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .1 SOR/2008 - 197 Storage tank systems for petroleum products and allied petroleum products regulations.
 - .2 Canadian Environmental Assessment Act (CEAA), 1992, c. 37.
 - .3 Canada Labour Code (R.S. 1985, c. L-2).
 - .1 Part II (September 2002) - Occupational Health and Safety.
 - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .3 Underwriters' Laboratories of Canada (ULC).
 - .1 ULC-S603-Latest Edition, Underground Steel Tanks.
 - .2 ULC-S615-Latest Edition, Underground Reinforced Plastic Tanks.

1.4 SUBMITTALS

- .1 Submit written tank description in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide written description of tank, its former contents, location and reason for removal.
- .3 Provide Departmental Representative with copy of vapour removal test results.
- .4 Forward letter notifying Parks Canada and Department of Environment in writing within 30 days of transfer of ownership for permanent files on site and authority having jurisdiction.
- .5 On site records of removal.
- .6 Contractor records and approvals for transfer of ownership of above ground fuel oil tanks.
- .7 Information required by Parks Canada to notify minister or environment through FIRSTS of permanent with drawing of the system.

1.5 QUALITY ASSURANCE

- .1 Contractor must be licensed/certified by authorities having jurisdiction for removal of Above Ground storage tanks.
 - .1 License/certificate, title and number must accompany tender document.
 - .2 Regulatory Requirements: Ensure Work is performed in compliance with CEPA, and CERA T10GA and Applicable Provincial Regulations.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse in accordance with Waste Management Plan.
- .2 Divert metal materials from landfill to metal recycling facility.
- .3 Segregate and deliver non-salvageable or non-recyclable materials, including waste liquids and sludges to Provincially licensed waste facility.

2 Products

2.1 NOT USED

- .1 Not Used.

3 Execution

3.1 PREPARATION SAFETY AND SECURITY

- .1 Conform to or exceed Federal and Provincial codes, local municipal by-laws, by-laws, and codes and regulations of utility authorities having jurisdiction.
- .2 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Procedures.
- .3 Protection.
 - .1 Meet safety requirements of Occupational Safety and Health, Canada Labour Code Part II and Regulations for Construction Projects.
 - .2 Disconnect or remove source of ignition from vicinity of tank.
 - .3 Provide temporary protection for safe movement of personnel and vehicle traffic.
 - .4 Cut, braze or weld metal only in monitored areas established to be free of ignitable vapour concentrations.
 - .5 Ground and bond metal equipment, including tanks and transfer pipes, before operating equipment or transferring flammable materials.
 - .6 Use non-sparking tools and intrinsically safe electrical equipment.
 - .7 Smoking is not permitted.

3.2 DRAINING

- .1 Drain and flush piping into tank.
- .2 Pump out liquid from tank
 - .1 Use explosion proof, air driven or hand pump.
- .3 Remove sludge from tank bottom.
 - .1 Dispose of product and sludge in accordance with local, Provincial and Federal regulations using waste disposal carrier licensed by Provincial and Federal Environmental Agency having jurisdiction.

3.3 TANK REMOVAL

- .1 Remove tank in accordance with CEPA SOR/2008-197 and CCME Code of Practice PN1326 and place in secure location.
- .2 Block tank to prevent movement.
- .3 Contact Departmental Representative immediately if there is evidence of contamination in tank excavation, stop Work until further notice. Owner will be hiring a third party Consultant to complete contamination testing.
- .4 Backfilling must not occur until confirmation has been received from soil testing. Contractor to allow four working day period for confirmation receipt.

3.4 VAPOUR REMOVAL

- .1 Purging:
 - .1 Purge vapors to less than 10% of lower explosive limit (LEL).
 - .2 Verify with combustible gas meter.
- .2 Inverting:
 - .1 Displace oxygen to levels below necessary to sustain combustion.
 - .2 Verify with combustible gas meter.
- .3 Water Method:
 - .1 Fill tank with water to expel vapors.
 - .2 Remove and dispose of contaminated water in accordance with regulations after tank is removed from site.
 - .3 Verify with combustible gas meter.
- .4 Dry Ice Method:
 - .1 Add 1.85 gm of solid carbon dioxide (dry ice) for each 100 liter capacity.
 - .2 Crush and distribute ice evenly over greatest area to secure rapid evaporation. Avoid skin contact.
 - .3 Verify dry ice has vaporized.
- .5 Air Method:
 - .1 Ventilate tank with air using small gas exhauster operated with compressed air.
 - .2 Air to enter opening at one end and to exit opening at other end to quickly remove vapour.
 - .3 Test interior of tank to determine when tank is free of vapour.

3.5 CAPPING

- .1 Plug holes after tank has been freed of vapors and before tank is moved from site.
 - .1 Leave vents open.
- .2 Plug corrosion leak holes using screwed (boiler) plugs.
- .3 Leave 3 mm vent hole in one plug to prevent tank from being subjected to excessive pressure differential caused by extreme temperature change.

3.6 SECURING AND REMOVAL FROM SITE

- .1 Check vapour levels prior to transport.
 - .1 Remove vapour if required.
- .2 Refurbish and transfer ownership of tank in accordance with local, Provincial and Federal regulations.
- .3 Truck removal.
 - .1 Secure tank on truck for transport to disposal site.
 - .2 Cut suitable openings in tank sides to render tank unusable.
 - .3 Ensure 3 mm vent hole located at uppermost point on tank.

3.7 SITE REMEDIATION

- .1 Repair/replace finish grade to patch surrounding area. Provide seed and sod to match surrounding area.

3.8 CONTAMINATED SOIL

- .1 Third party Consultant to be commissioned by Parks Canada for testing the soil material and confirming the presence/absence of hydrocarbon impacts.
- .2 No contaminated soil remediation of pre existing conditions is to be included for in this contract.
- .3 In the event of required contaminated soil remediation, remediation to be completed in accordance with most recent CCME environment quality guidelines as well as the Canada wide standard for petroleum hydrocarbons.

3.9 WORKMANSHIP AND DISPOSAL

- .1 Tanks destined for disposal.
 - .1 Dismantle, cut sufficient openings or otherwise render unusable.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 22 - Construction/Demolition Waste Management and Disposal.
- .3 Section 01 45 00 - Testing and Quality Control.
- .4 Section 01 61 00 - Common Product Requirements.
- .5 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

- .1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).
- .2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).
- .3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .4 National Fire Code of Canada.

1.3 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Conform to latest MPI requirements for exterior painting work including preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Consultant.
- .7 Standard of Acceptance:
 - .1 Walls: No defects visible from a distance of 1000 mm at 900 to surface.
 - .2 Soffits: No defects visible from floor at 450 to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of color and uniformity of sheen across full surface area.

1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- .1 Provide paint products meeting MPI "Environmentally Friendly" E1 ratings based on VOC (EPA Method 24) content levels.

1.5 INSPECTION REQUIREMENTS

- .1 Exterior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify the Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.
- .2 Exterior surfaces requiring painting shall be inspected by the Paint Inspection Agency who shall notify Consultant in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

- .3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Owner.

1.6 SCHEDULING OF WORK

- .1 Submit work schedule for various stages of painting to Consultant for approval. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Consultant for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about the building.

1.7 SUBMITTALS

- .1 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Upon completion, submit records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Color numbers.
 - .4 MPI Environmentally Friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets (MSDS).

1.8 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate mm sample panels of each paint with specified paint or coating in colors, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
 - .1 3 mm plate steel for finishes over metal surfaces.
 - .2 13 mm birch plywood for finishes over wood surfaces.
 - .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
 - .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
 - .5 10 mm cedar for finishes over wood surfaces.
- .3 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.
- .4 Submit full range of available colors where color availability is restricted.

1.9 QUALITY CONTROL

- .1 Provide mock-up in accordance with Section 01 45 00 - Testing and Quality Control.
- .2 When requested by the Consultant or Paint Inspection Agency, prepare and paint designated surface, area, room or item (in each color scheme) to requirements specified herein, with specified paint or coating showing selected colors, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.10 EXTRA MATERIALS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit one - one liter can of each type and color of primer. Identify color and paint type in relation to established color schedule and finish system.
- .3 Deliver to Contractor and store where directed.

1.11 DELIVERY, HANDLING AND STORAGE

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original containers, sealed, with labels intact.
- .3 Labels shall clearly indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Color number in accordance with established color schedule.
- .4 Remove damaged, opened and rejected materials from site.
- .5 Provide and maintain dry, temperature controlled, secure storage.
- .6 Observe manufacturer's recommendations for storage and handling.
- .7 Store materials and supplies away from heat generating devices.
- .8 Store materials and equipment in a well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .9 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .10 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Consultant. After completion of operations, return areas to clean condition to approval of Consultant.
- .11 Remove paint materials from storage only in quantities required for same day use.
- .12 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .13 Fire Safety Requirements:
 - .1 Provide one kg Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.12 SITE REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
 - .1 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .2 Where required, provide continuous ventilation for seven days after completion of application of paint.
 - .3 Coordinate use of existing ventilation system with Owner and ensure its operation during and after application of paint as required.
 - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - .5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:
 - .1 ambient air and substrate temperatures are below 10 degrees C.
 - .2 substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 the relative humidity is above 85% or when dew point is less than 3 degrees C variance between air/surface temperature.

- .5 rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
- .2 Perform no painting work when maximum moisture content of substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
- .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
 - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
 - .3 Apply paint only when previous coat of paint is dry or adequately cured.
 - .4 Apply paint finishes only when conditions forecast for entire period of application fall within manufacturer's recommendations.
 - .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
 - .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
 - .7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
 - .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
 - .9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of the Consultant such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.13 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate for disposal waste material generated by this Section.
- .2 Place in appropriate on-site bins in accordance with Waste Management Plan.
- .3 A weekly clean-up is mandatory and is to be undertaken the day prior to job site meeting.
- .4 Failure to comply will result in clean-up and administrative costs being allocated and backcharged on a pro rated basis.

2 Products

2.1 MATERIALS

- .1 Paint materials listed in the latest edition of the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for paint systems shall be products of a single manufacturer.
- .3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, shall:
 - .1 be water-based.
 - .2 be non-flammable.
 - .3 be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

- .4 be manufactured without compounds which contribute to smog in the lower atmosphere.
- .5 do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .6 have a recycled content of ___% post-consumer or post-industrial waste, have a recycled content: of ___% ___ waste.
- .5 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .6 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .7 Water-borne surface coatings and recycled water-borne surface coatings must have a flash point of 61.00C or greater.
- .8 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
 - .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
 - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .9 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.
- .10 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.
- .11 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0 ppm weight/weight total product.
 - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
 - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
 - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.
- .12 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
 - .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
 - .2 Mercury is to be determined by Cold Vapor Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
 - .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.2 COLOURS

- .1 Consultant will provide Color Schedule after Contract award
- .2 Color schedule will be based upon selection of five base colors and three accent colors. No more than eight colors will be selected for the entire project and no more than three colors will be selected in each area.
- .3 Selection of colors will be from manufacturers full range of colors.
- .4 Where specific products are available in a restricted range of colors, selection will be based on the limited range.
- .5 Second coat in a three coat system to be tinted slightly lighter color than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

- .1 Perform color tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Consultant's written permission.
- .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

- .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
- .4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:
- .2 Gloss Level Category /Units @ 60 (/Units @ 60/
- .3 G1 - matte finish 0 to 5 max. 10
- .4 G2 - velvet finish 0 to 10 10 to 35
- .5 G3 - eggshell finish 10 to 25 10 to 35
- .6 G4 - satin finish 20 to 35 min. 35
- .7 G5 - semi-gloss finish 35 to 70
- .8 G6 - gloss finish 70 to 85
- .9 G7 - high gloss finish > 85
- .10 Gloss level ratings of painted surfaces shall be as specified herein.

2.5 EXTERIOR PAINTING SYSTEMS

- .1 Asphalt Surfaces: zone/traffic marking for drive and parking areas, etc.
 - .1 EXT 2.1A Latex zone/traffic marking finish.
- .2 Concrete Vertical Surfaces: (including horizontal soffits)
 - .1 EXT 3.1A - Latex insert gloss level finish.
 - .2 EXT 3.1B - Latex insert texture type aggregate/insert gloss level latex finish.
 - .3 EXT 3.1C - Waterborne light industrial insert gloss level coating.
 - .4 EXT 3.1D - Epoxy finish for chemical resistance.
 - .5 EXT 3.1E - Waterborne epoxy finish for chemical resistance.
 - .6 EXT 3.1F - Elastomeric coating.
 - .7 EXT 3.1G - Water repellent non-paintable finish.
 - .8 EXT 3.1H - Water repellent paintable finish.
 - .9 EXT 3.1J - Concrete stain finish.
 - .10 EXT 3.1K - Latex insert gloss level finish (over alkali resistant primer).
 - .11 EXT 3.1L - High-build latex insert gloss level finish.
 - .12 EXT 3.1M - Pigmented polyurethane finish (over epoxy).
 - .13 EXT 3.1N - Latex insert gloss level aggregate finish.
- .3 Concrete Horizontal Surfaces: decks
 - .1 EXT 3.2A - Latex floor paint gloss finish.
 - .2 EXT 3.2B - Latex deck coating.
 - .3 EXT 3.2C - Epoxy non-slip deck coating.
 - .4 EXT 3.2E - Latex zone/traffic marking finish for parking lines, etc.
 - .5 EXT 3.2G - Clear sealer.
 - .6 EXT 3.2H - Clear waterborne sealer.
 - .7 EXT 3.2J - Concrete stain finish.
- .4 Cementitious Composition Board Surfaces: (vertical surfaces, horizontal soffits)
 - .1 EXT 3.3A - Latex insert gloss level finish.
 - .2 EXT 3.3C - Waterborne light industrial insert gloss level coating.
 - .3 EXT 3.3D - Waterborne epoxy finish.
 - .4 EXT 3.3E - Epoxy finish.
 - .5 EXT 3.3F - Pigmented polyurethane finish (over epoxy).
 - .6 EXT 3.3G - Latex insert gloss level aggregate finish.
 - .7 EXT 3.3H - High-build latex finish.
 - .8 EXT 3.3J - Latex insert gloss level finish (over alkali resistant primer).
- .5 Clay Masonry Units: (pressed and extruded brick)

- .1 EXT 4.1A - Latex insert gloss level finish.
- .2 EXT 4.1B - Latex insert gloss level aggregate finish.
- .3 EXT 4.1C - Waterborne light industrial insert gloss level coating.
- .4 EXT 4.1D - Epoxy finish for smooth brick.
- .5 EXT 4.1E - Waterborne epoxy finish for smooth brick.
- .6 EXT 4.1F - Water repellent non-paintable finish.
- .7 EXT 4.1G - Water repellent paintable finish.
- .8 EXT 4.1H - High-build latex finish.
- .9 EXT 4.1J - Pigmented polyurethane finish (over epoxy).
- .6 Concrete Masonry Units: smooth and split face block and brick
 - .1 EXT 4.2A - Latex insert gloss level finish.
 - .2 EXT 4.2B - Latex insert gloss level aggregate finish.
 - .3 EXT 4.2C - Waterborne light industrial insert gloss level coating.
 - .4 EXT 4.2D - Elastomeric finish.
 - .5 EXT 4.2E - Epoxy finish.
 - .6 EXT 4.2F - Waterborne epoxy finish.
 - .7 EXT 4.2G - Pigmented polyurethane finish (over high build epoxy).
 - .8 EXT 4.2H - Water repellent non-paintable finish not for use on light weight block.
 - .9 EXT 4.2J - Water repellent paintable finish not for use on light weight block.
 - .10 EXT 4.2K - High-build latex finish.
 - .11 EXT 4.2L - Latex insert gloss level finish (over alkali resistant primer).
- .7 Structural Steel and Metal Fabrications:
 - .1 EXT 5.1A - Quick dry enamel insert gloss level finish.
 - .2 EXT 5.1B - Waterborne light industrial insert gloss level coating (over inorganic zinc).
 - .3 EXT 5.1E - Waterborne epoxy finish.
 - .4 EXT 5.1F - Epoxy finish.
 - .5 EXT 5.1G - Pigmented polyurethane finish (over epoxy zinc rich primer and high build epoxy).
 - .6 EXT 5.1H - Pigmented polyurethane finish (over epoxy).
 - .7 EXT 5.1J - Pigmented polyurethane finish (over high build epoxy).
 - .8 EXT 5.1K - Aluminum paint finish.
 - .9 EXT 5.1L - Pigmented polyurethane finish (over inorganic zinc primer and high build epoxy).
 - .10 EXT 5.1M - Waterborne light industrial insert gloss level coating (over waterborne primer).
 - .11 EXT 5.1N - Waterborne light industrial insert gloss level coating (over epoxy primer).
 - .12 EXT 5.1P - Pigmented polyurethane finish (over epoxy zinc rich primer).
 - .13 Structural Steel and Metal Fabrications Decorative Elements (galvanized surfaces):
 - .1 Benjamin Moore DTM Acrylic.
 - .2 Touch up surface damage to galvanizing prior to application.
 - .14 Structural Steel and Metal Fabrications Decorative Elements (non-galvanized surfaces):
 - .1 Coro-Bond Super Etch by Coronado Industrial Coatings.
 - .2 Prime water retaining surfaces and edges twice.
 - .3 Polyurethane High Gloss Enamel, Rust Scat by Coronado Industrial Coatings,
- .8 Steel - High Heat: heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted
 - .1 EXT 5.2A - Heat resistant enamel finish, maximum 205 0C.
 - .2 EXT 5.2B - Heat resistant aluminum enamel finish, maximum 427 0C.
 - .3 EXT 5.2C - Inorganic zinc rich coating, maximum 400 0C.
 - .4 EXT 5.2D - High heat resistant coating, maximum 593 0C.
- .9 Galvanized Metal: not chromate passivated
 - .1 EXT 5.3A - Latex gloss level 5 finish.
 - .2 EXT 5.3C - Epoxy finish for use in high contact/high traffic areas.
 - .3 EXT 5.3D - Pigmented polyurethane finish for use in high contact/high traffic areas.
 - .4 EXT 5.3E - Bituminous finish for use in low contact/low traffic areas, e.g. unexposed galv. metal next to concrete, masonry, etc..
 - .5 EXT 5.3F - Aluminum paint finish for use in low contact/low traffic areas only.
 - .6 EXT 5.3G - Waterborne light industrial insert gloss level coating for moderate chemical

- resistance.
- .7 EXT 5.3H - Latex insert gloss level finish (over waterborne primer) for use in low contact/low traffic areas.
- .8 EXT 5.3J - Waterborne light industrial insert gloss level coating (over waterborne primer) for moderate chemical resistance.
- .10 Aluminum: sash, sills and frames, flashing, posts and railings, downpipes, etc.
 - .1 EXT 5.4B - Pigmented polyurethane finish (over epoxy).
 - .2 EXT 5.4C - Aluminum paint finish for exposed aluminum.
 - .3 EXT 5.4D - Bituminous finish for unexposed aluminum next to concrete, masonry, etc.
 - .4 EXT 5.4E - Epoxy finish.
 - .5 EXT 5.4G - Waterborne light industrial insert gloss level coating.
 - .6 EXT 5.4H - Latex insert gloss level finish.
- .11 Copper: excluding roofs
 - .1 EXT 5.5B - Pigmented polyurethane finish (over epoxy).
 - .2 EXT 5.5C - Aluminum paint finish.
 - .3 EXT 5.5D - Bituminous finish for unexposed copper next to concrete, masonry, etc.
 - .4 EXT 5.5E - Epoxy finish.
 - .5 EXT 5.5G - Waterborne light industrial insert gloss level coating.
 - .6 EXT 5.5H - Latex insert gloss level finish.
- .12 Stainless Steel: unpolished
 - .1 EXT 5.6B - Pigmented polyurethane finish.
 - .2 EXT 5.6C - Aluminum paint finish.
 - .3 EXT 5.6D - Epoxy finish.
 - .4 EXT 5.6E - Waterborne epoxy finish.
 - .5 EXT 5.6F - Latex finish.
 - .6 EXT 5.6G - Waterborne light industrial insert gloss level coating.
- .13 Glue Laminated Beams and Columns:
 - .1 EXT 6.1C - Solid color stain finish.
 - .2 EXT 6.1D - Varnish gloss finish (over stain).
 - .3 EXT 6.1E - Clear (2 component) polyurethane finish (over stain).
 - .4 EXT 6.1F - Pigmented fire retardant coating.
 - .5 EXT 6.1G - Clear fire retardant penetrating wood preservative coating.
 - .6 EXT 6.1H - Clear (2 component) polyurethane finish.
 - .7 EXT 6.1J - Pigmented polyurethane finish.
 - .8 EXT 6.1K - Varnish gloss finish.
 - .9 EXT 6.1L - Latex insert gloss level finish (over latex primer).
- .14 Dimension Lumber: columns, beams, exposed joists, underside of decking, siding, fencing, etc.
 - .1 EXT 6.2B - Waterborne solid color stain finish.
 - .2 EXT 6.2D - Solid color stain finish.
 - .3 EXT 6.2E - Varnish gloss finish (over stain).
 - .4 EXT 6.2F - Pigmented fire retardant insert gloss level coating.
 - .5 EXT 6.2G - Clear fire retardant penetrating wood preservative coating.
 - .6 EXT 6.2H - Clear (2 component) polyurethane finish.
 - .7 EXT 6.2J - Pigmented polyurethane finish.
 - .8 EXT 6.2K - Varnish gloss finish.
 - .9 EXT 6.2L - Semi-transparent stain finish.
 - .10 EXT 6.2M - Latex gloss level 3 finish (over latex primer).
- .15 Dressed Lumber: doors, door and window frames, casings, battens, smooth fascias, etc.
 - .1 EXT 6.3A - Latex insert gloss level finish. do not use flat finish on doors.
 - .2 EXT 6.3C - Solid color stain finish do not use in high contact areas or on doors.
 - .3 EXT 6.3D - Semi-transparent stain finish do not use on doors.
 - .4 EXT 6.3E - Varnish gloss finish (over stain).
 - .5 EXT 6.3F - Varnish gloss finish.
 - .6 EXT 6.3G - Clear (2 component) polyurethane finish.
 - .7 EXT 6.3H - Pigmented polyurethane finish.
 - .8 EXT 6.3J - Waterborne light industrial insert gloss level coating use gloss or semi-gloss finish on doors and frames only.

- .9 EXT 6.3K - Waterborne solid color stain finish do not use flat finish on doors and frames.
- .10 EXT 6.3L - Latex gloss level 3 finish (over latex primer) do not use flat finish on doors.
- .16 Wood Paneling: plywood siding, fascias, soffits, etc.
 - .1 EXT 6.4A - Waterborne solid color stain finish.
 - .2 EXT 6.4C - Solid color stain finish.
 - .3 EXT 6.4D - Semi-transparent stain finish.
 - .4 EXT 6.4E - Pigmented fire retardant coating.
 - .5 EXT 6.4F - Clear fire retardant penetrating wood preservative coating.
 - .6 EXT 6.4H - Varnish gloss finish.
 - .7 EXT 6.4J - Varnish gloss finish (over stain).
 - .8 EXT 6.4K - Latex gloss level 3 finish (over latex primer).
- .17 Wood Decks and Stairs/Steps: using spaced lumber
 - .1 EXT 6.5A - Latex porch and floor insert gloss level finish with anti-skid additive (over primer).
 - .2 EXT 6.5D - Deck stain (over wood preservative) for untreated wood.
 - .3 EXT 6.5E - Latex porch and floor insert gloss level finish with anti-skid additive (over latex primer).
 - .4 EXT 6.5F - Deck stain finish.
 - .5 EXT 6.5G - Latex deck coating for plywood decks.
- .18 Wood Shingle and Shake Siding:
 - .1 EXT 6.6C - Solid color stain finish.
 - .2 EXT 6.6D - Waterborne solid color stain finish.
 - .3 EXT 6.6E - Latex insert gloss level finish (over latex primer).
 - .4 EXT 6.6F - Semi-transparent stain finish.
- .19 Fiberglass: panels, trims, fabrications, etc.
 - .1 EXT 6.7A - Latex insert gloss level finish.
 - .2 EXT 6.7C - Waterborne light industrial insert gloss level coating.
 - .3 EXT 6.7D - Pigmented polyurethane finish (over epoxy).
 - .4 EXT 6.7E Waterborne epoxy finish.
 - .5 EXT 6.7F - Epoxy finish.
- .20 Plastic: vinyl siding and trim, ABS/PVA/PVC materials, fabrications, etc.
 - .1 EXT 6.8A - Latex insert gloss level finish.
 - .2 EXT 6.8C - Waterborne light industrial insert gloss level coating.
- .21 Stucco: walls and soffits
 - .1 EXT 9.1A - Latex insert gloss level finish.
 - .2 EXT 9.1B - Waterborne light industrial insert gloss level coating.
 - .3 EXT 9.1C - Elastomeric coating.
 - .4 EXT 9.1D - Epoxy finish.
 - .5 EXT 9.1E - Waterborne epoxy finish.
 - .6 EXT 9.1F - Water repellent non-paintable finish.
 - .7 EXT 9.1G - Water repellent paintable finish.
 - .8 EXT 9.1H - High-build latex finish.
 - .9 EXT 9.1J - Latex insert gloss level finish (over alkali resistant primer).
- .22 Canvas and Cotton Coverings: pipes, ductwork, etc.
 - .1 EXT 10.1A - Latex insert gloss level finish.
 - .2 EXT 10.1B - Waterborne light industrial insert gloss level coating.
 - .3 EXT 10.1D - Aluminum paint finish.
- .23 Bituminous Coated Surfaces: cast iron pipe, concrete, etc.
 - .1 EXT 10.2A - Latex insert gloss level finish.
 - .2 EXT 10.2B - Latex insert gloss level aggregate finish.
 - .3 EXT 10.2D - Aluminum paint finish.

2.6 SPECIAL FINISHES:

- .1 ____.

3 Execution

3.1 GENERAL

- .1 Perform preparation and operations for exterior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Consultant. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Stucco: 12%.
 - .2 Concrete: 12%.
 - .3 Clay and Concrete Block/Brick: 12%.
 - .4 Wood: 15%.

3.3 PROTECTION

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Consultant.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect passing pedestrians, building occupants in and about the building.
- .5 Removal of light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking painting operations by General Contractor. Items shall be securely stored and re-installed after painting is completed by General Contractor.
- .6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Consultant.

3.4 CLEANING AND PREPARATION

- .1 Clean and prepare exterior surfaces in accordance with MPI Painting Specification Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by brushing, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent (and bleach where applicable) and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.
- .2 Clean the following surfaces with high pressure water washing: ____.
- .3 Prevent contamination of cleaned surfaces by salts, acids, alkalies, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration

- occurs.
- .4 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
 - .5 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
 - .6 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, or brushing/vacuum cleaning.
 - .7 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.
 - .8 Do not apply paint until prepared surfaces have been accepted by the Inspecting Agency.

3.5 APPLICATION

- .1 Method of application to be as approved by Consultant. Apply paint by brush. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Consultant.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
 - .4 Brush out immediately runs and sags.
 - .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Consultant.
- .5 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.
- .9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with color and finish to match adjacent surfaces, except as noted otherwise.
- .2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by

- manufacturer of equipment.
- .3 Do not paint over nameplates.
- .4 Paint fire protection piping red.
- .5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

3.7 FIELD QUALITY CONTROL

- .1 Field inspection of exterior painting operations to be carried out by independent inspection firm as designated by Consultant.
- .2 Advise Consultant when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Co-operate with inspection firm and provide access to areas of work.

3.8 RESTORATION

- .1 Clean and re-install all hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 01 10 10 - General Requirements.

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
- .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
- .5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Color coding chart.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval 4 weeks prior to Substantial Completion. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
 - .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .8 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical

- drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
- .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different color waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
- .1 Prior to start of testing, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing using as-built drawings.
 - .5 Submit completed electronic and reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Testing and Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Procedures.

1.4 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
 - .1 One glass for each gauge glass.
 - .2 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
 - .3 One trap per 10 trap used each size.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

1.6 DEFICIENCY LIST

- .1 Lists of work deficiencies will be issued at anytime. Rectify immediately work to satisfaction of Departmental Representative.
- .2 Submit requests for takeover inspection in writing.

1.7 SITE SERVICES

- .1 Known Services:
 - .1 Drawings indicate known existing facilities.
 - .2 Locate all known services prior to initiating work.
 - .3 Consult with and follow Engineer's written instructions before commencing work.
 - .4 Once location has been set out, assume responsibility for all damage during installation.

.2 Bear cost of repairs and replacements made necessary.

.2 Unknown Services:

.1 Locate all services whose exact location is not known.

.2 Avoid damaging or displacing existing services where exact position is not known. Should any damage occur, advise Engineer in writing for remedial instructions.

1.8 CO-ORDINATION

.1 Locate distribution systems, equipment and materials to provide minimum interference and maximum usable space.

.2 Where interference occurs, Departmental Representative shall approve location of equipment and materials regardless of installation sequence.

1.9 REGULATIONS

.1 Comply with most stringent requirements of NBC, Provincial and Municipal regulations and by-laws, specified standards, codes and these specifications and plans. Practices contained in these standards or standards suggested or recommended by referenced organizations, are to be taken as minimum requirements.

.2 Furnish certificates confirming work installed conforms to requirements of authorities having jurisdiction.

1.10 DRAWINGS

.1 Drawings:

.1 Are not intended to show structural details or architectural features.

.2 Are not to be scaled.

.3 Except where dimensioned, the drawings indicate general mechanical layouts only.

.2 Provide field drawings to indicate relative position of various services when required by Departmental Representative. Obtain Departmental Representative's approval before commencing work.

.3 As-Built (Record) Drawings:

.1 Maintain as specified in Section 01 78 00 - Closeout Submittals.

1.11 EQUIPMENT LIST

.1 Submit list of manufacturers named within 7 days after award of the contract. Do not order equipment until list is approved.

1.12 ENERGY CONSUMPTION

.1 Departmental Representative may reject equipment submitted for approval on basis of performance or energy consumed or demanded.

1.13 APPROVAL OF EQUIPMENT

.1 When equipment list has been reviewed by Departmental Representative, conform to Section 01 33 00 - Submittals for items shown on equipment list and all other materials and equipment necessary to complete requirements of mechanical systems. This includes equipment named under Standard of Acceptance.

1.14 BREAKDOWN OF COSTS

.1 Price will be broken down at tender time as required by depository instructions.

.2 Immediately upon notice of contract award, further break down tender price as per Par. 1.34.

1.15 ACCEPTABLE PRODUCT

.1 Means that item named and specified by catalogue number meets specification in all respects regarding performance, quality of material and workmanship, and is acceptable to Departmental

- Representative.
- .2 Equipment proposed shall meet same standards.
- .3 Owner and Departmental Representative reserve the right to make final decision on proposed equipment usage, if different from that specified or accepted as an approved equal.

1.16 AS INDICATED

- .1 Means that the item or items specified are shown or noted on the drawings.

1.17 EQUIPMENT REQUIREMENTS & INSTALLATION

- .1 Permit equipment maintenance and disassembly by use of unions or flanges to minimize disturbance to connecting piping without interference from building structure or other equipment.
- .2 Provide accessible means for lubricating equipment including permanent lubricated "lifetime" bearings.
- .3 Mount base mounted equipment on chamfered edge housekeeping pads a minimum of 100mm high and 50mm larger than equipment dimension all around. Pads provided by this Contractor. Coordinate sizes with equipment provider.
- .4 Pipe drain lines to drains in a manner to avoid disruption of surrounding space.
- .5 Line-up equipment, rectangular cleanouts and similar items with building walls wherever possible.
- .6 Contractor to provide metal caps and counter flashing for all roof penetrations provided under this section. Installation by this Contractor. This Contractor responsible for all membrane flashing.

1.18 RESPONSIBILITY FOR TEMPORARY TRIAL USAGE

- .1 Protect work against damage or loss until accepted by the Departmental Representative.
- .2 Obtain written permission to start and test permanent equipment and systems prior to acceptance by Departmental Representative.
- .3 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material and instruments required for testing.
- .4 See Division 21 for temporary usage. Guarantee period and commencement date shall not be affected.
- .5 Clean and renew equipment and system used prior to acceptance. Restore to original, new and full working condition.
- .6 Temporary usage includes steam blow.

1.19 ANCHOR BOLTS & TEMPLATES

- .1 Supplied and installed by Contractor responsible.

1.20 PROTECTION OF OPENINGS

- .1 Protect equipment, system openings including rough-in plumbing from dirt, dust and other foreign materials with materials compatible to the system.

1.21 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Electric equipment shall bear CSA label.
- .2 Conform to requirements of Canadian Electrical Code, Local Provincial and Municipal Authorities and specified standards.
- .3 Division 21, 22 and 23 responsible for their respective conduit, wiring and connections below 50 V which are related to control systems specified in Division 15 and shown on mechanical drawings. Refer to Electrical section for quality of materials and workmanship for wiring and conduit.
- .4 Motors.
 - .1 Provide motors for mechanical equipment.
 - .2 If delivery of specified motor will delay delivery or installation of any equipment, install a motor for temporary use. Final acceptance of equipment will not occur until specified motor is installed.
- .5 Motors under 372 W: Speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 115V or 208V, unless otherwise specified.
- .6 Motors 372 W and larger: EEMAC Class B, squirrel cage induction, continuous duty, drip proof, ball

- bearing, maximum temperature rise 40EC, three phase, 208V in building, unless otherwise specified.
- .7 Provide motors, low voltage 50 V and less, wiring from transformers, and temperature pressure, humidity control devices.
 - .8 Furnish composite wiring diagrams with remote interlocks for control systems, including performance and sequence of operation description of mechanical systems. Submit for approval by Departmental Representative.

1.22 SLEEVES

- .1 Provide pipe sleeves at points where pipes pass through masonry or concrete walls or floors.
- .2 Provide acoustical pipe penetration seals where pipes pass through equipment room walls or floors.
 - .1 Seals to consist of two bolted pipe halves with minimum 19mm neoprene sponge bonded to inner face.
 - .2 Seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping.
- .3 Use cast iron or steel pipe sleeves with annular fin continuously welded at midpoint:
 - .1 Through foundation walls.
 - .2 Where sleeve extends above finished floor.
- .4 Sizes:
 - .1 Provide 6mm clearance all around, between sleeve and pipes or between sleeve and insulation.
 - .2 Where piping passes below footings, provide minimum clearance of 50mm between sleeve and pipe. Backfill up to underside of footing with concrete of same strength as footing.
- .5 Terminate sleeves flush with surface of concrete and masonry and 50mm above floors in mechanical or fan rooms or rooms susceptible to leaks. Not applicable to concrete floors on grade.
- .6 For pipes passing through roofs, use cast iron sleeves with caulking recess and flashing clamp device. Provide flashing and counter flashing as necessary for installation by Division 21, 22 or 23 contractor responsible. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make water-tight durable joint.
- .7 Fill voids around pipes. Remove plastic sleeves.
 - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof pre-retardant non-hardening mastic.
 - .2 Where sleeves pass through walls or floors, caulk space between insulation and sleeve or between pipe and sleeve with waterproof fire retardant non-hardening mastic. Seal space at each end also with same.
 - .3 Ensure no contact between copper tube or pipe and ferrous sleeve.
 - .4 Fill future-use sleeves with lime plaster.
 - .5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M + Amdt - Mar-78.
- .8 Temporarily plug all openings during construction.

1.23 ESCUTCHEONS AND PLATES

- .1 Provide on pipes passing through finished walls, partitions, floors and ceilings.
- .2 Use chrome or nickel plated brass, solid type, with set screws for ceiling or wall mounting. Use cast iron type in equipment room.
- .3 Inside diameter shall fit around finished pipe. Outside diameter shall cover opening or sleeve.
- .4 Where sleeve extends above finished floor, escutcheons or plates shall clear sleeve extension.
- .5 Secure to pipe or finished surface but not insulation.

1.24 TESTS

- .1 Provide the following supplementary requirements to tests specified:
 - .1 Give written 24 hours notice of date when tests will be made.
 - .2 Do not insulate or conceal work until tested and approved. Follow construction schedule and arrange for tests.
 - .3 Conduct tests in presence of Engineer.

- .4 Bear costs including retesting and making good.
- .5 Pipe pressure:
 - .1 Hydraulically test all water supply and steam supply systems at 12 times system operating pressure or minimum 860 kPa.
 - .2 Maintain test pressures without loss for 4 hours unless otherwise specified.
 - .3 Test drainage, waste and vent piping to code.
 - .4 Prior to test isolate all equipment or other parts which are incomplete or not designed to withstand test pressures.
 - .5 All piping of the drainage and venting systems shall be tested by means of filling the system with water after all outlets have been plugged. All joints shall be checked and the water level must hold without dropping for a period of one hour before the work is to be backfilled or otherwise built-in. Sections of the system may be tested separately provided they are at least 3000mm high and include at least 1500mm of the section below, where applicable. Any leaks observed must be corrected by additional caulking of joints or if necessary by removal of any section of pipe required.
 - .6 Testing shall be done before pipe covering is installed. Leaks must be located, corrected and test reapplied before acceptance of building.
 - .7 Provide test certification for all tests signed by Engineer or designated representative.

1.25 PAINTING

- .1 Apply at least one coat of corrosion resistant primer paint to supports, and equipment fabricated from ferrous metals.
- .2 Prime and touch up marred finished paintwork to match original.

1.26 SPECIAL TOOLS AND SPARE PARTS

- .1 Furnish spare parts as follows:
 - .1 One set of mechanical seals for pump.
 - .2 One casing joint gasket for pump.
- .2 Identify spare parts containers as to contents and replacement parts numbers.
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .4 Furnish one grease gun and adapters to suit different types of grease and grease fittings complete with 2 tubes of each kind of grease.

1.27 DIELECTRIC COUPLINGS

- .1 Provide wherever pipes of dissimilar metals are jointed.
- .2 Provide insulating unions for pipe sizes NPS 2 and under and insulating flanges for pipe sizes over NPS 2.
- .3 Cast brass adapters may be used where approved by Engineer.
- .4 Provide felt or rubber gaskets to prevent dissimilar metals contact.

1.28 DRAIN VALVES

- .1 Minimum NPS 19mm unless otherwise specified: straight pattern bronze with hose end male thread and complete with cap and chain.
- .2 Locate at all low points and section isolating valves unless otherwise specified.
- .3 Acceptable Product: Dahl

1.29 INSTRUCTION OF OPERATING STAFF

- .1 Provide certified personnel to instruct operating staff on operation of mechanical equipment. Provide maintenance specialist personnel to instruct operating staff on maintenance and adjustment of mechanical equipment and any changes or modification in equipment made under terms of guarantee.
- .2 Provide instruction during regular work hours prior to acceptance and turn-over to operating staff for regular operation.

- .3 Use operation and maintenance data manual for instruction purposes. On completion of instruction, turn one manual over to Owner and the balance to Engineer.
- .4 This Contractor to ensure mechanical systems are complete and fully operational as per the requirements of these documents and the applicable codes. Premature failure of any mechanical system(s) and/or related accessories deemed to be the result of poor workmanship shall be the financial responsibility of the Contractor responsible.

1.30 OPERATING AND MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual specified in the Section 01 78 00 - Closeout Submittals.
- .2 Definition: detailed information and records of individual products provided by manufacturer of supplier as part of project requirements, and of systems, describing operation and maintenance of each item.
- .3 Operating data to include:
 - .1 Environmental and other control schematics for each system.
 - .2 Description of each system and its controls.
 - .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
 - .4 Operating instruction for each system and each component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Color coding chart.
- .4 Maintenance data shall include:
 - .1 Servicing, maintenance, operating and trouble-shooting instructions for each item of equipment.
 - .2 Equipment manufacturer's performance data sheets.
 - .3 Equipment performance verification test results.
- .5 Approvals:
 - .1 Submit 1 draft of Operating and Maintenance Manual to Engineer for approval one month prior to estimated substantial completion date. Submission of individual data will not be accepted unless so directed by Engineer.
 - .2 Make any changes in submission as may be required and re-submit as directed.
 - .3 Failure to do so will result in delay of progress payment.
- .6 Provide two (2) bound final copies of operating and maintenance manuals to Owner and one (1) bound final copy to Engineer.

1.31 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures. Provide all shop drawings within 30 days after contract has been awarded. Failure to do so will delay progress payments. Photocopies of fax sheets or poor quality photocopies will not be acceptable for shop drawings.
- .2 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances, access door swing spaces.
 - .3 Internal wiring diagrams if applicable.
- .3 Shop drawings and product data shall be accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify as to current production.
 - .5 Certification of compliance to applicable codes.
- .4 Keep 1 copy of shop drawings and product data on site, available for reference purposes at all times.

1.32 CLEANING AND FINAL ADJUSTMENT

- .1 Clean interior and exterior of all systems including strainers.
- .2 Clean and refurbish all equipment and leave in first class operating condition including replacement of all filters in all piping systems.
- .3 Balance and adjust all systems and each piece of equipment to operate efficiently.

1.33 AS-BUILT RECORD DRAWINGS BY CONTRACTOR

- .1 General: to be read in conjunction with Section 01 78 00- Closeout Submittals.
- .2 Site records:
 - .1 Mark thereon all changes as work progresses and as changes occur.
 - .2 Transfer information to show all work as actually installed.
 - .3 Make these drawings available for reference purposes and to inspection at all times.
- .3 As-built drawings:
 - .1 Prior to start of testing, balancing and adjusting, finalize production of ACAD as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS". Signature of contractor and date to be included.
 - .3 Submit to Engineer for approval and make all corrections as directed.
 - .4 Testing, balancing and adjusting to be performed using as-built drawings.
 - .5 Hand over completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.34 CUTTING & PATCHING

- .1 All cutting and patching required to properly accommodate the work of this Division shall be the financial responsibility of respective Division 21, 22 or 23 and carried out by trades to the applicable Specifications provided in this document. The General Contractor for this contract will be liable and financially responsible for the work required for the installation of the new roof top units, including but not limited to, demolition to cut the holes in the roof, structural support for the roof curbs and modified roofing to the new curbs. The roofing Sub-Contractor and General Contractor will carry the Warrantee for roofing in areas affected by new construction. Roof areas unaffected by such work will be carried by the original contractor involved with the base-build contract.

3 Execution

3.1 REPAIRS/ RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged extensively for priming and touch-up.

3.2 CLEANING

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

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Testing and Quality Control and submit report as described in PART 1 - SUBMITTALS.
 - .1 Radiographic testing.
 - .2 Pressure test.
- .2 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 - 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 Steam and condensate lines and appurtenance.
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Where specified elsewhere in Division 22 or 23 manufacturers to provide demonstrations and instructions.
- .5 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .6 Instruction duration time requirements as specified in appropriate sections.
- .7 Departmental Representative will record these demonstrations on video tape for future reference.

3.5 PROTECTION

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

End of Section

1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with 01 33 00 - Submittal Procedures.
- .2 Indicate on manufacturers catalogue literature the following:
 - .1 Upper attachment.
 - .2 Middle attachment.
 - .3 Pipe attachment.
 - .4 Riser clamps.
 - .5 Shields and saddles.
 - .6 Sway braces.

1.2 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in 01 78 00 - Closeout Submittals.

2 Products

2.1 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.
- .2 Support from top of structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

2.2 UPPER ATTACHMENTS

- .1 Concrete:
 - .1 Inserts for cast in place concrete: galvanized steel wedge to MSS SP58, type 18. ULC listed for pipe NPS 3/4 through NPS 8.
 - .1 Carbon steel plate with clevis, for surface mount: malleable iron socket and expansion case and bolt. Minimum two expansion cases and bolts for each hanger.
- .2 Steel beam (bottom flange):
 - .1 Cold piping 2" and under: malleable iron C clamp to MSS SP58, type 19. ULC listed.
 - .1 Cold piping NPS 2 1/2 and larger and all hot piping: malleable iron beam clamp to MSS SP58, type 28 or 29. ULC listed.
- .3 Steel beam (top):
 - .1 Cold piping NPS 2 and under: malleable iron "top of beam" C clamp to MSS SP58, type 19. ULC listed.
 - .1 Cold piping NPS 2 1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS SP58, type 25. ULC listed.
- .4 Steel joist:
 - .1 Cold piping 2" and under: steel washer plate with double locking nuts.
 - .1 Cold piping NPS 2 1/2 and larger and all hot piping: steel washer plates with double locking nut, carbon steel clevis and malleable iron socket.
- .5 Steel channel or angle (bottom):
 - .1 Cold piping NPS 2 and under; malleable iron C clamp to MSS SP58, type 23. ULC listed.
 - .1 Cold piping NPS 2 1/2 and larger and all hot piping; universal channel clamp. ULC listed.
- .6 Steel channel or angle (top):
 - .1 Cold piping 2" and under; malleable iron "top of beam" C clamp to MSS SP58, type 19. ULC listed.
 - .1 Cold piping NPS 2 1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS SP58, type 25. ULC listed.

2.3 MIDDLE ATTACHMENT

- .1 Carbon steel threaded rod black electro-galvanized for mechanical rooms finish.

2.4 PIPE ATTACHMENT

- .1 Cold piping, steel or cast iron: hot piping steel, with less than 25mm horizontal movement; hot piping, steel, with more than 300mm middle attachment (rod) length: adjustable clevis to MSS SP58, type 1. ULC listed.
- .2 Cold copper piping; hot copper piping with less than 25mm horizontal movement; hot copper piping with more than 300mm middle attachment (rod) length: adjustable clevis to MSS SP58, type 1. Copper plated.
- .3 Suspended hot piping, steel and copper, with horizontal movement in excess of 25mm; hot steel piping with middle attachment (rod) 300mm or less; pipe roller to MSS SP58, type 43.
- .4 Bottom supported hot piping, steel and copper: pipe roller stand to MSS SP58, type 45.

2.5 RISER CLAMPS

- .1 Steel or cast iron pipe: galvanized black carbon steel to MSS SP58, type 42. ULC listed.
- .2 Copper pipe: carbon steel copper finished to MSS SP58, type 42.

2.6 SADDLES AND SHIELDS

- .1 Cold piping NPS 1-1/4" and over: protection shield with high density insulation under shield with uninterrupted vapour barrier.
- .2 Hot piping NPS 1 1/4 and over: protective saddle with insulation under saddle. Saddle to be tack welded to pipe.

2.7 GUIDES AND ANCHORS

- .1 Guides: Provide factory-built guide lines to permit axial movement only and to restrain lateral and angular movement. Guides must be designed to withstand a minimum of 15 percent of the axial force which will be imposed on the expansion joints and anchors. Field-built guides may be used if detailed on the contract drawings.
- .2 Anchors and Guides: Provide type, quantity and spacing as recommended by manufacturer of expansion joint and as shown. A professional engineer shall verify in writing that anchors and guides are properly designed for forces and moments which will be imposed

3 Execution

3.1 HANGER SPACING

- .1 Spacing and middle attachment (rod) diameter as specified in paragraphs below or as in table below, whichever is more stringent.
 - .1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.
- .2 Copper piping: up to NPS 1/2: every 1.5m
- .3 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.
- .4 Within 12" of each horizontal elbow.

Pipe Size: NPS	Rod Diameter	Maximum Spacing Steel	Maximum Spacing Copper
up to 1 ¼	9mm	2.1m	1.8m
1 ½	9mm	2.7m	2.4m
2	9mm	3m	2.7m
2 ½	13mm	3.6m	3m
3	13mm	3.6m	3m
3 ½	13mm	3.9m	3.3m

4	16mm	4.2m	3.6m
5	16mm	4.8m	
6	22mm	5.1m	
8	22mm	5.8m	
10	22mm	6.7m	
12	22mm	7m	

.5 Hanger spacing for alternate materials shall be provided as per manufacturers recommendations.

3.2 HANGER INSTALLATION

- .1 Offset hanger so that rod is vertical in operating position.
- .2 Adjust hangers to equalize load.

End of Section

1 General

1.1 REFERENCES

- .1 Do Identification work in accordance with CGSB 24 GP 3a, Identification and Classification of Piping Systems.
- .2 Provide ULC and CSA registration plates as required by respective agency.
- .3 Federal Legislation:
 - .1 Canadian Environmental Protection Act (CEPA) 1999 c.33.
 - .2 SOR/2008-197 storage tank systems for petroleum products and allied petroleum products requirements.

1.2 SAMPLES

- .1 Submit samples in accordance with 01 33 00 - Submittal Procedures.
- .2 Submit samples and lists of proposed wording for approval before engraving.

2 Products

2.1 MANUFACTURERS NAMEPLATES

- .1 Each piece of equipment shall have a metal nameplate mechanically fastened to equipment, with raised or recessed letters. Nameplates to be located so that they are easily read. Do not insulate or paint over plates.
- .2 Include registration plates (eg. Pressure vessel, Underwriters' Laboratories and CSA approval) as required by respective agency and as specified. The supplier shall indicate size, equipment model, manufacturer=s name, serial number, voltage, cycle, phase and power of motors.

2.2 SYSTEM NAMEPLATES

- .1 Major equipment to be identified with laminated plastic plates with black face and white centre (lettering) of minimum size 875mm x 38mm x 2mm nominal thickness, engraved with 1/2" high lettering.
- .2 Nameplates to be fastened securely with pop rivets or screws in conspicuous place. Where nameplates cannot be mounted, such as on cool surfaces, provide standoffs.
- .3 Equipment type, number and service or areas or zone of building it serves to be identified.

2.3 EQUIPMENT CONCEALED BY CEILING

- .1 At valves, plumbing air vents and drains, and other similar pieces of equipment located above T-bar ceilings or access doors, provide circular 18mm diameter self adhesive identification discs on the underside of the ceiling, located as near as possible to where the item is located.
- .2 Discs shall be coloured as scheduled in this specification.
- .3 Where the item has a primary and secondary colour, provide a 18mm diameter primary color disc with a 18mm diameter secondary color disc centred on the primary disc.
- .4 For backflow preventors, fire dampers, air terminal units, exhaust fans, reheat coils and other similar pieces of equipment located above T-bar ceilings or access doors, provide laminated plastic plates as noted for System nameplates above. A second identical plate shall be installed on the underside of the ceiling grid or access door opening frame, as close as possible to the location of the equipment.

2.4 PIPE IDENTIFICATION

- .1 Medium in piping to be identified as indicated below showing name and service, including temperature and pressure as indicated below, and directional flow arrows where relevant.
- .2 Colour Bands, Arrows and Wrap mark
 - .1 Plastic coated cloth material with protective over coating and waterproof contact adhesive undercoating, suitable for continuous operating temperature of 148°C and intermittent temperature of 204°C

- .2 50mm wide tape single wrap around pipe or pipe covering with ends overlapping one pipe diameter but not less than 25mm for colour bands. Tape is to be cut, not torn.
- .3 Block capital letters 50mm high for pipes of 75mm nominal and larger o.d. including insulation and not less than 18mm high for smaller diameters to be used.
- .4 Direction arrows 150mm long by 50mm wide for piping of 75mm nominal or larger o.d. including insulation and 100mm long by 18mm wide for smaller diameters to be used. Double headed arrows to be used where direction of flow is reversible.
- .5 Waterproof and heat resistant plastic marker tags to be used for pipes and tubing of 3/4" nominal and smaller o.d.
- .6 Use black pipe marker letters and direction arrows. Use white on red background for fire protection pipe markers.
- .7 Use wrap mark in lieu of colour band, arrows and stencils.
- .3 Stenciled Identification
 - .1 Provide stenciled identification using a first quality environmentally friendly paint and colour bands. Letters shall be a minimum of 50mm
- .4 Location Identification
 - .1 Markers and classifying colours on piping systems to be located so they can be seen from floor or platform.
 - .2 Piping runs to be identified at least once in each room.
 - .3 Do not exceed 10m between identification in open areas.
 - .4 Both sides where piping passes through walls, partitions and floors to be identified.
 - .5 Where piping is concealed in pipe chase or other confined space, point of entry and leaving, and at each access opening to be identified.
 - .6 Piping to be identified at starting and ending points of runs and at each piece of equipment.
 - .7 Identify branch, equipment or building served after each valve. (ie, heating zones are to be identified in Boiler Rooms).
 - .8 Provide primary and secondary colour banding.

Pipe Marker Legend	Valve Tag Legend	Primary Colour (Background)	Second Colour
Gasoline	GASOLINE	Yellow	Black
Diesel	DIESEL	Yellow	Black

- .5 Valves:
 - .1 38mm laminated plastic plates (tags) with corner hole shall be provided for all valves and installed with nonferrous chains, "5" hooks or heavy duty plastic tie wraps. Tags shall have horizontal 12mm letters accurately aligned and machine engraved into the core. Required for all valves and operating controllers.
 - .2 Provide one valve chart for each Operations and Maintenance Manual and one chart framed and wall mounted.
 - .3 Valves in systems to be numbered consecutively.
- .6 Buried Pipe Identification
 - .1 Use detectable Identoline underground warning tape colour coded to pipe service for full length of pipe.
 - .2 Bury to manufacturers recommendations.
 - .3 Identify all systems, equipment, components, controls and sensors. Inscription to identify function.
- .7 Controls Equipment Identification
 - .1 Electrically fed equipment supplied by Division 23 (excluding that noted in .2, below) shall be identified as per Division 26 identification requirements.
 - .2 Intermediate and end control devices including sensors, controllers, monitoring devices, etc., shall be identified with laminated plastic plates as noted for System nameplates above. The plates shall be fastened securely with pop rivets or screws. Where rivets or screws are not feasible, provide heavy duty plastic tie wraps. As a minimum control device identification shall correspond to descriptors provided in the approved shop drawings with respect to panel designation or DDC point name.

3 Execution

3.1 GENERAL

- .1 Do identification work in accordance with CGSB 24 GP 3a except where specified otherwise.

3.2 LOCATION OF NAMEPLATES

- .1 In conspicuous location to facilitate easy reading from operating floor and to properly identify equipment and/or system.
- .2 Provide stand offs for nameplates on hot surfaces and insulated surfaces.
- .3 Do not insulate or paint over plates.

3.3 PIPING

- .1 Locations:
 - .1 Adjacent to all changes in direction.
 - .2 At least once in each small room through which piping passes.
 - .3 On both sides of visual obstruction or where run is difficult to follow.
 - .4 On both sides of any separation such as walls, floors and partitions.
 - .5 Where piping is concealed in pipe chase, ceiling space, gallery or other confined space, at entry and leaving points and adjacent to each access opening.
 - .6 At beginning and end points of each run and at each piece of equipment in run.
 - .7 At point immediately upstream of major manually operated or automatically controlled valves. Where this is not possible, place identification as close to valve as possible, preferably on upstream side.
 - .8 Legend to be easily and accurately readable from usual operating areas and all readily accessible points.
 - .9 Plane of legend to be approximately at right angles to most convenient line of sight with consideration of operating positions, lighting conditions, reduced visibility of colour or legends caused by dust and dirt and risk of physical damage.

3.4 VALVES AND CONTROLLERS

- .1 Secure tags with non-ferrous chains or closed "S" hooks for valves and operating controllers.
- .2 Install one (1) copy of flow diagram and valve schedule mounted in frame with non glare glass where directed by Engineer. Provide one copy in each operating and maintenance instruction manual.
- .3 Consecutively number valves in system.

3.5 BURIED PIPE IDENTIFICATION

- .1 Use Detectable Identoline underground warning tape colour coded to pipe service for full length of pipe.
- .2 Bury to manufacturer's recommendations.

End of Section

1 General

1.1 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME-B16.3, Malleable Iron Threaded Fittings.
 - .2 ASME-B16.9, Factory-Made Wrought Steel Butt welding Fittings.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M, Specification for Pipe Steel Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .3 ASTM B61, Specification for Steam or Valve Bronze Castings.
 - .4 ASTM B75M, Specification for Seamless Copper Tube.
- .3 Canadian Standards Association (CSA)
 - .1 CSA B139-2009, Installation Code for Oil Burning Equipment.
 - .2 CSA B140, General Requirements for Oil Burning Equipment.
- .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
- .5 National Fire Protection Association.
- .6 NFCC 2010, National Fire Code of Canada
- .7 CCME PIN1326 COP 2003, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .8 Canadian Environmental Protection Act, (CEPA) SOR/2008-197

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Indicate on manufacturer's catalogue literature the following: - valves.
 - .2 Submit WHMIS MSDS sheets. Indicate VOC's for adhesives and solvents during application and curing.
 - .3 Do construction occupational health and safety in accordance with Parks Canada Occupational Health and Safety requirements.
 - .4 Test Reports: Submit certified test reports from approved independent testing laboratories indicating compliance with specification for specified performance characteristics and physical properties.
 - .5 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .6 Instructions: submit manufacturers installation instructions.
 - .7 Closeout Submittals : Submit maintenance and Engineering Data per Section 01 78 00.

1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Waste Management and Disposal
 - .1 Separate waste materials for reuse in accordance with Provincial regulations.
 - .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .2 Collect, separate and dispose of paper packaging material in appropriate off-site location for recycling.
 - .3 Collect and dispose of materials defined as hazardous or toxic in appropriate off-site location for disposal.
 - .4 Unused paint materials must be disposed of at official hazardous materials collection sites.
 - .5 Unused sealant materials must be disposed of in accordance with provincial regulations.
 - .6 Handle and dispose of hazardous materials in accordance with Canadian Environmental Protection Act (CEPA), Transportation of Dangerous Goods Act (TEGA), Regrounds and Municipal Regulations.

1.4 MANUFACTURER'S GUARANTY

- .1 Provide equipment manufacturer's guaranty naming Owner as beneficiary and covering defects and deficiencies for minimum of 2 years from date the work is certified as substantially performed.
- .2 Guaranty shall cover materials and include repair or replacement at manufacturer's expense, to extent required, of work of this Section in event of failure if such failure results from defects and deficiencies in product manufacture.

1.5 WARRANTY

- .1 Warrant work of this Section for period of 2 years against defects and/or deficiencies in accordance with General Conditions of the Contract. Priority correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner. Defects include but are not limited to improper installation, failure of equipment for purpose intended, damaged equipment and other similar requirements pertaining to medical equipment.

2 Products

2.1 FILL, VENT AND CARRIER PIPE (ABOVE GROUND)

- .1 Steel: to ASTM A53/A53M, Schedule 80, galvanized, continuous weld or ERW, screwed.

2.2 PIPE COATING

- .1 Bituminous Paint: to suit application and in accordance with manufacturer's recommendations. For exterior, above ground, underground, or galvanized piping.

2.3 FUEL TRANSFER / DISPENSERS / PUMPS

- .1 Two (2) positive displacement, self-priming, gear type pumping units with integral centrifugal air separator and adjustable bypass valve. Unit to come with suction strainers at inlet connections. Internal filter with a ten-micron filter, 1-1/2" NPT inlet connection and 1" NPT discharge connection. Two-stage solenoid valve. Cabinet finish to be powder-coated. Color to be determined by departmental representative prior to ordering. Dispenser to come with a nozzle boot and hook, on/off handle for dispenser activation. Dispenser to come with hose retractor, illuminated register face for nighttime operation and solenoid valves. Mechanical register to display dispensed amount of fuel on both sides of cabinet. Dispenser to be a single unit with two (2) pumps capable of dispensing two (2) products. Dispenser to come with aboveground sump below unit to suit aboveground piping.
- .2 Capacity (Gasoline)
 - .1 Pumped fluid: Unleaded Gasoline (13/16" O.D.) for standard gasoline service)
 - .2 Motor: 1 HP
 - .3 Pumps: Up to 22 GPM (83 lpm) per hose
- .3 Capacity (Diesel)
 - .1 Pumped fluid: Diesel (15/16" O.D.) for standard auto diesel service)
 - .2 Motor: 1 HP
 - .3 Pumps: Up to 22 GPM (83 lpm) per hose

2.4 JOINTING MATERIAL

- .1 Screwed fittings: teflon tape or pulverized lead paste.

2.5 FITTINGS

- .1 Steel:
 - .1 Malleable iron: screwed, banded, Class 150 to ASME-B16.3.
 - .2 Steel: butt-welding to ASME-B16.9.
 - .3 Unions: malleable iron, brass to iron, ground seat, screwed, to ASTM A47M.
 - .4 Nipples: Schedule 40, to ASTM A53.
- .2 Copper: copper fittings, flared compression joints.
- .3 Flexible connections: A wire braided kink-proof flexible connection with woven jacket and oil proof

synthetic tube and cover and neoprene liner shall be used. Supporting wire shall run the full length of hose. Hose-to-pipe connectors are to be of the removable metal compression type. Temperature range shall be -40°C to 121°C.

2.6 GATE VALVES

- .1 NPS 2 and under, screwed:
 - .1 Rising stem: to MSS SP-80, Class 125, 860 kPa, bronze body, solid wedge disc.

2.7 GLOBE VALVES

- .1 NPS 2 and under, screwed
 - .1 To MSS SP-80, Class 125, 860 kPa, bronze body, screwed over bonnet, renewable bronze disc composition disc suitable for oil service.
 - .2 Lockshield handles: as indicated.

2.8 BALL VALVES

- .1 NPS 2 and under:
 - .1 Bronze body, screwed ends, TFE seal, hard chrome ball, 4 MPa, WOG.

2.9 CHECK VALVES

- .1 NPS 2 and under, screwed:
 - .1 To MSS SP-80, Class 125, 860 kPa, bronze body, soft resilient, renewable composition disc suitable for oil service, screw over cap, regrindable seat.

2.10 LUBRICATED PLUG COCKS

- .1 NPS 2 and under, screwed:
 - .1 To ASTM B61, Class 150, 1 MPa, bronze body.

2.11 ANTI-SIPHON VALVE

- .1 Automatic shut-off to prevent spillage in the event of line rupture, cast or ductile iron body, adjustable hydrostatic pressure, brass trim, corrosion-resistant steel spring, fluorocarbon seal, sized for application, built-in thermal expansion pressure relief valve.

2.12 ABOVEGROUND PIPING SYSTEM

- .1 Containment Sump:
 - .1 High density polyethylene or epoxy coated steel dispenser sump, located below dual pump dispenser, aboveground as shown on drawings, to be at local low point of piping system. Sump liquid tight with access. Leak detection sensor to be installed. To come with entry boots as required.
- .2 Aboveground Piping:
 - .1 Fuel oil piping to be steel to ASTM A53/A53M, Schedule 80, galvanized weld or ERW, screwed.
 - .2 Fittings: ASTM B16.3, black malleable iron, Class 150 (300 lb. WOG), threaded or butt welded steel to ASME-B16.9.
 - .3 Joints: NFPA 30, threaded ANSI B31.4 teflon tape or pulverized lead paste.
 - .4 Thread Sealant: Make up all threaded connections utilizing sealant that is compatible with intended service.
 - .5 Pipe shall be labelled with plastic wrap around labels in accordance with ANSI A13.1. The labels shall have proper identification for both diesel and gas supply piping.
- .3 Accessories:
 - .1 All accessories and optional equipment as required for a complete and functional system; including piping adapters, test boots, reducers, sump entry boots, terminations, fittings, end caps, etc.

- .2 Provide bedding sand, pen gravel, and backfill material for piping. Top of system shall be a minimum of 18" below grade.
- .3 Located leak detector sumps to intercept all potential leakage. Maximum spacing 30 metres.
- .4 Buried utility warning tape: Install tape 300mm below grade, above the piping system.

2.13 FUEL OIL AND TANK VENT PIPING, ABOVE GROUND

- .1 Steel Pipe: ASTM A53 or ASME B36.10, Schedule 40 Black
 - .1 Fittings: ASTM B16.3, black malleable iron, Class 150 (300 lb. WOG), threaded.
 - .2 Joints: NFPA 30, threaded ANSI B31.4
 - .3 Thread Sealant: Make up all threaded connections utilizing sealant that is compatible with intended service.
 - .4 Pipe shall be labelled with plastic wrap around labels in accordance with ANSI A13.1. The labels shall have proper identification for supply piping (Gas & Diesel) Fuel Oil Vent, Fuel Oil Fill and Fuel Oil Drain, etc.

2.14 EMERGENCY SHUT-OFF VALVE

- .1 NPS 2 and under:
 - .1 Cast Iron body. ULC listed.

3 Execution

3.1 PIPING

- .1 Install oil piping in accordance with CSA B139 and CSA B140, latest editions.
- .2 Provide aboveground piping according to Federal, Provincial and Municipal codes and to the satisfaction of all Authorities Having Jurisdiction (AHJ).
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.
- .5 Slope piping down in direction of storage tank unless otherwise indicated or required by codes or AHJ.
- .6 Suction, vent, and piping:
 - .1 Before starting, cleaning, painting, labeling, all pipes shall be visually inspected for damage. All damaged areas shall be located and reported to Departmental Representative.
 - .2 Steel with screwed fittings.
 - .3 All connections in piping and tubing should be visible, accessible and made fuel oil-tight.
 - .4 All piping shall be substantially supported and located to protect against physical damage. Use protective casing, grating or checkered plate aluminum cover in high traffic areas.
- .7 Fill and vent piping outside building (above ground):
 - .1 Galvanized Steel piping welded throughout except at tanks where use electrically isolated fittings.
 - .2 Grading: slope piping at 1% minimum back to tanks.
- .8 Suction piping aboveground:
 - .1 Piping: Install in accordance with printed instructions of pipe manufacturer installation personnel shall be factory trained.
- .9 Use eccentric reducers at pipe size change installed to provide positive drainage.
- .10 Provide clearance for installation of insulation and access and maintenance of equipment, valves and fittings.
- .11 Ream pipes, clean scale and dirt, inside and out.
- .12 Apply two coats of bituminous paint to buried piping.
- .13 Piping at tanks.

3.2 VALVES

- .1 Install valves with stems upright or horizontal unless approved otherwise by Engineer.
- .2 Install ball valves at all branch take-offs, to isolate each piece of equipment and as indicated.
- .3 Install globe valves for balancing and in by- pass around control valves.
- .4 Install swing check valves on discharge of pumps and as indicated.
- .5 Install plug cocks as indicated.

3.3 TESTING

- .1 Test system in accordance with CSA B139 and CSA B140 and Authorities Having Jurisdiction (AHJ).
- .2 Isolate tanks from piping pressure tests.

3.4 FLUSHING AND CLEANING

- .1 Flush after pressure test with number 2 fuel oil for a minimum of 2 h. Clean strainers and replace filters.
- .2 Dispose of fuel oil for flushing out in accordance with requirements of AHJ.
- .3 Check vents from regulators, control valves are terminated in approved locations and are protected against blockage and damage.
- .4 Check entire installation is approved by AHJ.

3.5 COMMISSIONING, TRAINING AND CLOSEOUT

- .1 Submit certificate of completion that certifies all work provided on the fuel system has been completed in accordance with environmental codes, regulations and standards indicated.
- .2 Complete performance verification and calibration over fill prevention device, vent whistle, and leak detection system. Provide commissioning plan 4 weeks prior to first fill for review and acceptance. Provide documentation of performance verification and tests on completion.
- .3 Provide 16 hours of system training to maintenance staff on operation of fuel oil pumps, level monitoring system, over fill prevention devices, leak detection system and associated components and controls.

End of Section

1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI/NFPA-329, Handling Underground Releases of Flammable and Combustible Liquids.
 - .2 ANSI/API 650, Welded Steel Tanks for Oil Storage.
- .2 American Petroleum Institute (API).
 - .1 API STD 653, Tank Inspection, Repair, Alteration, and Reconstruction.
- .3 Canadian Council of Ministers of the Environment (CCME).
 - .1 CCME-PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .4 Department of Justice Canada (Jus).
 - .1 SoR/2008-197 Canadian Environmental Protection Act Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, 2008 (CEPA)
- .5 Canadian Standards Association (CSA)/CSA International.
 - .1 CAN/CSA-B139-09, Installation Code for Oil Burning Equipment.
- .6 The Master Painters Institute (MPI).
 - .1 Architectural Painting Specification Manual.
- .7 National Research Council/Institute for Research in Construction.
 - .1 NRCC 38727, National Fire Code of Canada (NFCC) Latest Edition.
- .8 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, (TDGA).
- .9 Underwriters' Laboratories of Canada (ULC).
 - .1 ULC/ORD-C58.12, Leak Detection Devices (Volumetric Type) for Underground Storage Tanks.
 - .2 ULC/ORD-C58.14, Leak Detection Devices (Non-volumetric Type) for Underground Storage Tanks.
 - .3 ULC/ORD-C58.15, Overfill Protection Devices for Underground Tanks.
 - .4 ULC/ORD-C107.7, Glass-Fibre Reinforced Plastic Pipe and Fittings.
 - .5 ULC/ORD-C107.19, Secondary Containment of Underground Piping.
 - .6 ULC/ORD-C142.23, Aboveground Waste Oil Tanks.
 - .7 ULC-S601, Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.
 - .8 ULC-S602, Aboveground Steel Tanks for Fuel Oil and Lubricating Oil.
 - .9 ULC-S652, Tank Assemblies for Collection of Used Oil.
- .10 Applicable federal, provincial and municipal codes and regulations.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate details of construction, appurtenances, installation, leakage detection system.
- .3 Shop drawings to detail and indicate following as applicable to project requirements. Submit manufacturer's product data to supplement shop drawings.
 - .1 Size, materials and locations of ladders, ladder cages, catwalks and lifting lugs.
 - .2 Tanks capacity.
 - .3 Size and location of fittings.
 - .4 Environmental compliance package accessories.
 - .5 Decals, type, size and location.
 - .6 Accessories: provide details and manufacturers product data.
 - .7 Size, material and location of manholes.
 - .8 Size, materials and locations of railings, stairs, ladders and walkways.
 - .9 Finishes.
 - .10 Electronic accessories: provide details and manufacturers product data.
 - .11 Insulation types, locations and RSI values.
 - .12 Identification, name, address and phone numbers of corrosion expert where applicable.

Note: Grading drawings to be stamped by licensed corrosion expert.

- .13 Piping, valves and fittings: type, materials, sizes, piping connection details, valve shut-off type and location.
 - .14 Spill containment: provide description of methods and show sizes, materials and locations for collecting spills at connection point between storage tank system and delivery truck, or vessel.
 - .15 Anchors: description, material, size and locations.
 - .16 Concrete: type, composition and strength.
 - .17 Size and location of site pads.
 - .18 Level gauging: type and locations, include:
 - .1 Reporting systems, types of reports and report frequency.
 - .2 Maximum number of tanks to be monitored.
 - .3 Number of probes required and sizes.
 - .4 Provide details and manufacturer's product data.
 - .19 Ancillary devices: provide details and manufacturer's product data.
 - .20 Leak detection system, type and locations, and alarm system.
 - .21 Grounding and bonding: provide details of design, type, materials and locations.
 - .22 Corrosion protection: provide details of design, type, materials and locations.
 - .23 Field-erected overfill-protection systems: provide details of design, type, materials and locations.
 - .24 Containment system for spills, overfills and storm runoff water: provide details, materials used, and locations.
- .4 Provide maintenance data for tank appurtenances and leakage detection system for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 MAINTENANCE DATA

- .1 Provide maintenance data for tank appurtenances for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials and appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse and recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan.
- .5 Place Materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .7 Clearly label location of salvaged material's storage areas and provide barriers and security devices.
- .8 Ensure emptied containers are sealed and stored safely.
- .9 Divert unused metal materials from landfill to metal recycling facility as approved by Owner's Representative.
- .10 Divert unused concrete materials from landfill to local quarry facility as approved by Owner's Representative.
- .11 Dispose of unused paint or coating materials at an official hazardous material collections site as approved by Owner's Representative.
- .12 Do not dispose of unused paint, thinners, solvents, etc. into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .13 Fold up metal banding, flatten and place in designated area for recycling.

1.5 MANUFACTURERS GUARANTEE

- .1 Provide equipment manufacturer's guaranty naming Owner as beneficiary and covering defects and deficiencies for minimum 5 years from date the work is certified as substantially performed.
- .2 Guaranty shall cover materials and include repair or replacement at manufacturer's expense, to extent required, of work of this Section in event of failure if such failure results from defects and deficiencies in product manufacture.

1.6 WARRANTY

- .1 Warrant work of this Section for period of 2 years against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner. Defects include but are not limited to improper installation, failure of equipment for purpose intended, damaged equipment and other similar requirements pertaining to medical equipment.

2 Products

2.1 STEEL TANKS

- .1 Two (2) 4,500 L (990 Imp. Gallons) capacity supplied and installed by this contractor.
 - .1 Construction horizontal cylindrical double walled to ULC-S601 standards, complete with two coats of red oxide primer to CAN/CGSB-1.150.
 - .2 Tank to be complete with skid saddles, level indicators, spill containment devices with locks, emergency vents, vacuum gauges with switches, lifting lugs, grounding lugs, pipe support bracket, mechanical gauges overfill protection to CCME, dipsticks and gauge charts supplied for each individual tank compartment. Provide connections, gauges, and switches to allow for connection to existing appurtenances (i.e. Levelometer, pump panel, alarm panel, level switches), to be connected by this contractor. Provide additional levelometer and connections to pump panel, alarm panel and level switches for second compartment.
 - .3 Platforms, ladders and handrails: Provide two (2) sets of welded steel tank attachments designed to support platform framing, stairs, ladders and live and dead loadings. Provide two (2) ladders with 20mm dia rungs at 300mm on centre. Provide two (2) access platforms and guard rails to allow for tank fueling, level measuring and inspection for each compartment. Clean and coat all surfaces as specified for tank.
 - .4 Vent Caps: Galvanized cast iron or cast aluminum with brass or bronze screens, arranged to permit full venting and prevent entry of foreign material into the vent line. Same pipe size as vent pipe.
 - .5 Fill Boxes: Spill container type enclosing a fill cap assembly with connection coordinated with fittings used by fuel supplier to comply with CCME and S14(2)(b) of the regulations.
 - .1 Liquid and vapor tight assembly, cylindrical body, quick-opening corrosion resistant watertight sealable cover, with minimum 5 gallon capacity.
 - .2 Fill cap shall be lockable, tight-fill design with provision for padlock on the top of the cap. Fill cap shall screw onto threaded adapter that can be removed without removing fill box. Entire assembly shall seal tight with no leakage during filling and when cap is in place.
 - .3 Spill containment device to comply with ORD-C142.19 latest edition.
 - .6 Finishes: Exterior of tank: Factory Applied Prime Coat to CAN/CGSB - 1.181 Ready Mix Organic Zinc Rich Coating, two (2) Coats of Suitable Corrosion Resistant Epoxy Paint, and one (1) top coat of suitable polyurethane paint.
 - .7 Vacuum applied to interstitial space. With vacuum gauge and pressure switch for connection to monitoring system.
 - .8 Fill signal device: Vent whistle, whistles when tank is being filled and stops whistling when tank at 90% tank capacity. Install on vent pipe at tank.
 - .9 Product transfer:
 - .1 Tank to be provided with normal and separate emergency vents.
 - .2 Liquid and vapor tight connection to be provided on fill pipes.

- .10 Over fill and spill containment.
 - .1 Automatic valve closure on product supply line, or automatic pump shut off to terminate petroleum product flow upon detection of high levels in storage tanks.
 - .2 Overfill protection device compatible with intended method of filling designed, built and certified to ULC/ORD-C 158.15

2.2 PIPING, VALVES AND FITTINGS

- .1 Flared Fittings to CSA B139 "Installation code for Oil Burning Equipment."
- .2 To Section 23 11 13 - Piping, Valves and Fittings Heating Fuel Oil.
- .3 Installation to meet all requirements of the National Fire Code of Canada, Part 4.

2.3 LEVEL GAUGING

- .1 Provide two (2) tank compartments level gauging and indicator.
- .2 Provide gauge and gauge openings protected against liquid overflow and possible liquid and vapour release.

2.4 GROUNDING AND BONDING

- .1 Provide grounding for tank.

2.5 DIGITAL TANK GAUGE SYSTEM

- .1 Gauge system shall be the mechanically or electronically actuated type that can continuously monitor a tank's usable liquid level storage capacity. The system shall provide a digital readout of both (2) tanks compartments liquid level in terms of mm and L inches and gallons. The system shall be accurate to plus or minus 2mm 1/16 inch. The system shall measure water accumulation in mm inches from 20 to 125mm 3/4 to 5 inches off the bottom of each storage tank compartment. Construct system components to be chemically compatible with the fuel to be handled. For each tank compartment monitored, provide a sending unit that transmits the digital readout from a tank to an electronic display panel. Panel shall be standard industrial enclosure. The panel shall display the digital readout of each monitored tank compartment on an LCD mounted exterior to the panel. The panel shall also have external controls to allow operators to toggle between information on the LCD without having to open the panel and shall provide paper printouts. Gas and Diesel tanks to come with float kits and magnetostrictive probes

2.6 LEAK DETECTION SYSTEMS

- .1 Automatic digital continuous monitoring systems responsive to the presence of water and hydrocarbons in the interstitial space of the double-wall tanks, in the tank manhole access enclosures, and in the aboveground containment sump at dual fuel dispenser. System shall distinguish between hydrocarbon and water and identify location of leak as to individual tank and piping system. System may be combined with tank fluid level monitor and alarm system specified.
- .2 Functions and Arrangements:
 - .1 Single control station to monitor all sensing probes.
 - .2 Visual indicator to monitor and identify leaks as water or hydrocarbon and location.
 - .3 Indicators showing system status including faults and alarms.
 - .4 On board printer that provides complete reports of all system functions upon command.
 - .5 Panel circuit test button.
 - .6 95 dB audible alarm with silencing control to sound when leak is detected.
 - .7 Eight hour memory backup system with battery.
 - .8 NEMA 250 Type 4 cabinet.
 - .9 UL or other accredited testing laboratory listing.
 - .10 Optional RS232 Modbus for future communications with control system to indicate system in service and alarm conditions.
 - .11 To come with a manufacturer specified weatherproof Nema 4x style enclosure with heat strips.
 - .12 System to be supplied with an alarm with buzzer and strobe light and be installed to sound if the presence of fuel is detected.

- .3 Sensors:
 - .1 Designed for required locations including: Insertion between walls of double-wall tanks, in aboveground containment sump at dual fuel dispenser and in tank manhole enclosures. Sensing points shall be at lowest point of each tank or sump. Intrinsically safe design.
 - .2 Sensing units shall detect presence of water and a minimum 3mm (0.125 inch) thick layer of hydrocarbon on surface of water and minimum 50mm (2 inch) thickness of hydrocarbon in area that has no water present.
 - .3 Sensors shall be arranged to allow replacement of individual sensors without disturbing other portions of leak detection system or fuel storage and piping system. Aboveground sensors shall be accessed through caps as grade.
 - .4 Materials of construction shall be non-corroding.
 - .5 Transmit status signal to control unit.
- .4 Components:
 - .1 Provide access for each sensor cap similar in construction to fill boxes. Access shall be cast iron, quick - opening cover, watertight, minimum size necessary to accommodate sensor caps. Provide identification plates, similar to those specified for fill points, labeled "MONITORING/OBSERVATION WELL-DO NOT FILL". Provide special tools if necessary for opening covers.
 - .2 Sensors housing from tank and piping to grade shall be schedule 40 PVC, or stainless steel.
 - .3 Wiring between probes and control unit: Place in water-tight corrosion-resistant conduit system.

2.7 DIGITAL FUEL TANK MANAGEMENT SYSTEM

- .1 Fuel management system capable of managing 2 hoses / pumps. To be capable of supporting magnetic stripe and cardless keypad entry and programmable to support individual PIN codes. Access to system to be password protection with administrator and operator level passwords. Capable to restrict daily fuel limits. Communications to be 4 serial ports for RS-232 and RS-485 communications for connectivity to remote readers, modems and printers. To include fuel management software capable to program time and volume limits on each pump. Corrosion resistant cabinet, stainless steel numeric keypad, LCD display screen. To be supplied with 100 programmable cards. System to have ability to notify via email. Wireless connectivity to be supplied for communication between operator workstation located in the maintenance garage office.

3 Execution

3.1 INSTALLATION

- .1 Install tanks in accordance with the most stringent requirements of CAN/CSA-B139, CCME-"Code of Practice" Provincial regulations and National Fire Code of Canada.
- .2 New fuel oil tank shall be installed and tagged by certified installer.
- .3 Install exterior piping level with supports as indicated and as required by codes and regulations.
- .4 Position tanks using lifting lugs and hooks, and where necessary use spreader bars. Do not use chains in contact with tank walls.

3.2 FIELD QUALITY CONTROL

- .1 Test tanks for leaks in presence of authority having jurisdiction.
- .2 Field erected tanks: field test for leaks in accordance with ANSI/API 650. API monogram is acceptable evidence of testing.

3.3 TOUCH-UP

- .1 Where coating is damaged, touch-up with original coating material.

3.4 LEVEL GAUGE SYSTEM

- .1 Provide leak and vapour proof caulking at connections and calibrate system.

3.5 COMMISSIONING REQUIREMENTS

- .1 Provide maintenance manuals and training of site personnel on operation of system.
- .2 Provide system pressure testing reports, and sensor commissioning reports.

3.6 LEAK DETECTION

- .1 Install leak detection systems for U/G containment sumps and interstitial space of oil tank. Leak detector shall conform to ULC ORD C107.12 and installed in accordance with manufacturer recommendations.

3.7 OVERFILL AND SPILL PROTECTION

- .1 Install flow restriction type overfill protection. System shall activate at 90% of tank capacity. System shall be installed in accordance with codes. Regulations and manufacturers recommendations.

3.8 COMMISSIONING, TRAINING AND CLOSEOUT

- .1 Submit certificate of completion that certifies all work provided on the fuel system has been completed in accordance with environmental codes, regulations and standards indicated.
- .2 Complete performance verification and calibration over fill prevention device, vent whistle, and leak detection system. Provide commissioning plan 4 weeks prior to first fill for review and acceptance. Provide documentation of performance verification and tests on completion.
- .3 Provide 16 hours of system training to maintenance staff on operation of fuel oil pumps, level monitoring system, over fill prevention devices, leak detection system and associated components and controls.

End of Section

1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
 - .2 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .3 CSA Z462-12, Workplace Electrical Safety.
- .2 Institute of Electrical and Electronics Engineers (IEEE) / National Electrical Safety Code Product Line (NESC).
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standard Terms, 7th Edition.

1.2 DEFINITIONS

- .1 Electrical terms used in electrical specifications and on electrical drawings are those defined by IEEE SP1122.

1.3 CARE, OPERATION AND START-UP

- .1 Instruct Departmental Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .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, maintenance, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment or component failure.
 - .5 Other items of instruction as recommended by manufacturer of the system or equipment.
- .3 Print or engrave operating instructions and mount under glass or laminated plastic adjacent to equipment or systems interface.
- .4 Arrange and pay for manufacturer's factory service technician to supervise start-up, installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .5 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 all aspects of its care and operation.

1.4 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235-83(R2000).
- .2 Motors, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 SITE VISIT

- .1 Prior to tender submission visit the site and become familiar with the job and all conditions which may affect the overall cost. Ignorance of existing conditions will not be considered as basis for extra claims. Refer to Division 01 - General Requirements for additional information.

1.6 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.
 - .1 Submit shop drawings for all electrical equipment unless otherwise indicated.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, and other items that must be shown to ensure coordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 If changes are required, resubmit corrected shop drawings.
- .2 Manufacturer's Field Reports: submit to Departmental Representative within 7 days of review, verifying compliance of work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.
- .3 Submit WHMIS MSDS information in accordance with Division 01 - General Requirements.
- .4 Upon completion of work submit As-Built Drawings, Maintenance Manuals, and Submittals in accordance with Division 01 - General Requirements.

1.7 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Division 01 - General Requirements.
- .2 All electrical work is to be carried out by qualified, licensed electricians or apprentices for the province of Nova Scotia and the electrical contractor must have a valid contractor license issued by the province of Nova Scotia.
 - .1 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 The Departmental Representative reserves the right to approve the quality of material and workmanship, and to call for any tests which they deem necessary to establish the integrity of the installation during the progress of the work and a complete test of each system at the completion of the work. The cost of such tests are not to be considered as extras.
- .4 Health and Safety: in accordance with Division 01 - General Requirements.
 - .1 Protect exposed live equipment during construction for personnel safety.
 - .2 Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage in English.
- .5 Quality Control: in accordance with Division 01 - General Requirements.
 - .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to the authority having jurisdiction for approval before delivery to site.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Upon completion of work, submit load balance report as described in PART 3 - LOAD BALANCE.
 - .4 Submit certificate of acceptance from authority having jurisdiction upon completion of work to Departmental Representative.

1.8 PERMITS, FEES AND INSPECTION

- .1 Submit to Electrical Inspection Division, Department of Environment, Labour and Justice, and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

- .2 Pay all associated fees.
- .3 Notify Departmental Representative of any changes required prior to making changes.
- .4 Submit Certificates of Acceptance from Electrical Inspection Division, Department of Environment, Labour and Justice, Supply Authorities, or authorities having jurisdiction on completion of work to Departmental Representative.

1.9 CO-ORDINATION

- .1 Co-ordinate all work with work of other divisions to avoid conflict and notify Departmental Representative if any changes are required.
- .2 Locate electrical systems, equipment, and materials to provide minimum interference and maximum usable space.
- .3 Contractor to locate any existing underground services that may be affected before commencing work and be responsible for any damages caused by failure to coordinate with and preserve underground services.
- .4 Where interference occurs, the Departmental Representative must approve relocation of equipment and materials regardless of installation order.
- .5 Notwithstanding the review of shop drawings, the Electrical Contractor may be required to relocate electrical equipment which interferes with the equipment of other trades, due to lack of co-ordination of the Electrical Contractor with other trades. The cost of this relocation will be the responsibility of the Electrical Contractor and the Departmental Representative will determine the extent of relocation required.
- .6 Leave space clear, and install equipment to accommodate future materials and/or equipment as indicated or specified, or to accommodate equipment and/or materials supplied by other Contractors.
- .7 Verify that the spaces in which the equipment is to be installed is sufficient and install all equipment to maintain clearances, to conserve space, comply with codes, and to ensure adequate space for future servicing.
- .8 The Drawings for the Electrical work are diagrammatic performance Drawings only intended to convey the scope of work and indicate the general arrangement, approximate location of apparatus and fixtures, and the approximate sizes and locations of equipment and outlets.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Provide Departmental Representative with material delivery schedule within two weeks after award of contract.
- .2 Arrange for delivery access and unloading and/or storage areas with General Contractor.

1.11 INSPECTION OF WORK

- .1 Periodic visits to the site during construction phase will take place to ascertain reasonable conformity to plans and specifications. The Contractor will be responsible for the execution of their work in conformity with the construction documents, the Contract, and the requirements of the inspection authority.

1.12 SCHEDULING OF WORK

- .1 Note that the Park intends to carry on business as usual and work activities must be coordinated to maintain electrical services in occupied areas. Provide any required temporary work.
- .2 Work activities which disrupt occupants of the Park, such as excessive noise caused by the work must be approved and scheduled in writing by the Departmental Representative at least 72 hours in advance.
- .3 All power shutdowns which affect Park operation must have prior approval of Departmental Representative and must be scheduled in writing at least 42 hours in advance with the Departmental Representative.

- .4 Overtime work, and work outside normal work hours deemed necessary to accomplish scheduling are the responsibility of the Contractor and must meet the requirements of the NS Employment Standards Act. All costs resulting from such overtime work must be included in the Contractor's total tender price.

2 Products

2.1 PRIOR APPROVAL OF PRODUCTS

- .1 The use of any product not listed by name in the specification must be approved by Departmental Representative prior to tender submission.
- .2 By using pre-approved product substitutions the Contractor accepts the responsibility and associated costs for all required modifications to circuitry, devices and wiring. The Contractor is to submit shop drawings with deviation from the original design highlighted to the Departmental Representative for review and approval prior to rough-in.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with Division 01 - General Requirements.
- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Division prior to delivery and submit such approval as described in Part 1 - Submittals.

2.3 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 indoor electrical equipment enclosures light grey to EEMAC 2Y-1.

2.4 WARNING SIGNS

- .1 As specified and to meet requirements of the Authority having Jurisdiction and Departmental Representative.
- .2 Porcelain enamel decal 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 and labels as follows:
 - .1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black white face, black white core, mechanically attached with self tapping screws.
 - .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 line	6 mm high letters
- .2 Labels:
 - .1 Embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior

to manufacture.

- .4 Allow for average of twenty-five (25) letters per nameplate and label.
- .5 Identification to be English.
- .6 Nameplates for pull boxes and junction boxes to indicate system name and voltage characteristics.
- .7 Nameplates for disconnects, starters and contactors to indicate equipment being controlled, wire, voltage, phase, number of power source and branch circuit breaker number.

2.7 WIRING IDENTIFICATION

- .1 Identify wiring with indelible pre-printed self-adhesive vinyl tape, indicating panel and circuit number. Wiring to be identified at both ends and at junction, pull boxes and splices.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1, Canadian Electrical Code.

3 Execution

3.1 NAMEPLATES AND LABELS

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

3.2 LOCATION OF EQUIPMENT

- .1 Change location of equipment at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

3.3 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.4 FIELD QUALITY CONTROL

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program will be permitted, under the direct supervision of a qualified licensed electrician.
 - .1 Permitted activities are to be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.
- .3 Load Balance:
 - .1 Measure phase current to panelboard with normal loads 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 Submit, at completion of work, report listing phase and neutral currents on panelboards and dry-core transformers, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.
- .4 Conduct and pay for following tests in accordance with Division 01 - General Requirements.
 - .1 Electrical distribution system including phasing, voltage, grounding and load balancing.

- .2 Circuits originating from branch distribution panels.
- .3 Lighting and its control.
- .5 Insulation resistance testing.
 - .1 Megger and record circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Check resistance to ground before energizing and record value.
- .6 Carry out tests in presence of Departmental Representative.
- .7 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.

3.5 CLEANING

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

End of Section

1 General

1.1 DESCRIPTION OF WORK

- .1 Work of this Section consists of the complete removal of all obsolete or abandoned electrical equipment including, but not limited to:
 - .1 Existing obsolete pump area lighting, conduit and wire.
 - .2 Obsolete power and communication system conduit and wire/cabling for the existing pumping system.
- .2 All removal or alteration work of electrical construction to be done in accordance with the safety standards outlined in the Canadian Electrical Code (CEC).

1.2 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Division 01 - General Requirements.

1.4 SITE SURVEY

- .1 Prior to Tender submission, visit the site and survey and quantify the extent of the removals/alterations required for this contract and include for all costs in the total tendered price. Any existing conditions information indicated on the drawings is for general guidance only.
- .2 In conjunction with site visit, review all drawings and include all costs due to existing conditions in total tendered price.

1.5 PROTECTION

- .1 The Contractor is responsible for any damages to existing structures or systems as a result of the work.

1.6 SALVAGE MATERIAL

- .1 Existing equipment and devices designated for reuse are to be removed, stored, cleaned and re-installed as indicated on the drawings.
- .2 Identify any damaged equipment or materials intended for reuse prior to demolition and point out deficiencies to the Departmental Representative at that time.

2 Products

2.1 NOT APPLICABLE

- .1 Not Applicable.

3 Execution

3.1 GENERAL REMOVALS

- .1 Where indicated remove all obsolete or abandoned equipment or electrical services including wire and conduit back to the source.
- .2 Coordinate work of this Section with other trades.
- .3 Schedule all removal work with the Departmental Representative. Do not disrupt building operations except as permitted by the Schedule.
- .4 Any existing conduit, wiring, boxes or equipment that is to remain in service is to be properly supported as required by the CEC. Any additional hangers, straps or fasteners required are to be supplied under this contract.

- .5 Make alterations to existing electrical services as required and make good all circuits affected by the renovations.
- .6 Any existing electrical circuits and/or equipment that are interrupted during construction to accommodate alterations but are to remain in service are to be reconnected and circuits made good.
- .7 Any relocating of existing equipment and any rerouting of existing wire and conduit to coordinate with new work to be included in total tendered price.

3.2 IDENTIFICATION OF EXISTING CIRCUITS AND EQUIPMENT

- .1 All circuits in existing panelboards serving renovated areas are to be traced out to identify any devices not labeled on existing directories and to confirm all circuits indicated on directories are accurate. Provide new, updated, typewritten circuit directories in all panelboards modified by the renovations.
- .2 Provide identification indicating circuit and panel number at all new and existing wiring devices in renovated area.
- .3 Provide equipment nameplates and labels for all new and existing equipment in renovated area.
- .4 Equipment identification, wiring identification and conduit and cable identification is to be in accordance with Section 26 05 00 - Common Work Results - Electrical.

3.3 CUTTING

- .1 Cutting required for removals and alterations to be to the approval of the Departmental Representative and performed with appropriate power tools.

3.4 CLEANING

- .1 Reused existing equipment to be cleaned in accordance with Division 01 - General Requirements.

End of Section

1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.2 No.18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2 No.65-93 (R2008), Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

2 Products

2.1 MATERIALS

- .1 Crimp style wire connectors, nylon insulated, with current carrying parts of copper alloy for conductors #16 AWG and smaller.
- .2 Fork tongue or ring style connectors, nylon insulated crimp style. Terminals for connecting conductors #16 AWG and smaller to screw down terminals.
- .3 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required. Use twist-on connectors for #14 AWG to #8 AWG conductors.
- .4 Fixture type twist-on splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors #10 AWG or less.
- .5 Compression type connectors for connecting #6 AWG conductors and larger, unless indicated otherwise.
- .6 Clamps or connectors for armoured cable, aluminum sheathed cable, Teck cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

3 Execution

3.1 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 is to meet secureness tests in accordance with CSA C22.2 No.65.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.
 - .3 Install crimp style connectors with snap-on nylon caps on splices and joints on branch circuits.
- .2 All connections are to be made electrically and mechanically secure. Size and type of connector to be in accordance with Manufacturers recommendations for each wire size and combination of wires.

3.2 RESTRICTIONS

- .1 Circuit splices are NOT permitted in equipment enclosures or electrical panelboards.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.
- .2 Section 26 05 20 - Wire and Box Connectors (0-1000V).
- .3 Section 26 05 29 - Hangers and Supports for Electrical Systems.
- .4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .5 Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 03-96, Test Methods for Electrical Wires and Cables.
 - .2 CAN/CSA C22.2 No. 131, Type TECK 90 Cable.
 - .3 CSA C22.2 No. 174, Cables and Cable Glands for use in Hazardous Locations.

2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for #8 AWG and larger, solid for #10 AWG and smaller.
- .2 Minimum size to be #12 AWG for lighting and power, #14 AWG for controls, #16 AWG for low voltage and lighting relay/controls.
- .3 Conductors to be sized as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE as indicated.
- .4 Single conductor metal sheathed cables are not permitted .
- .5 Conductor sizes on drawings are based on copper conductors. Aluminum Composite Material (ACM) conductors are not permitted.

2.2 TECK CABLE

- .1 Cable: to CAN/CSA C22.2 No. 131 and CSA 22.2 No 174..
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
 - .1 Chemically cross-linked polyethylene (XLPE), rated RW90, 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum.
- .6 Overall covering: thermoplastic polyvinyl chloride material.
- .7 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .8 Connectors:
 - .1 Watertight spin-on style connectors.
 - .2 Use sealed fitting connectors when installed in Class 1 Zone 1 Hazardous Locations.

2.3 CONTROL CABLES

- .1 Low energy 300 V control cable with stranded annealed copper conductors with PVC gas and oil resistant jacket and para magnetic shield over each conductor.

3 Execution

3.1 WIRING METHODS

- .1 Branch circuit work:
 - .1 Concealed work in wall partitions: building wire in conduit or armoured cable.
 - .2 Horizontal work above accessible ceilings: building wire in conduit or armoured cable.
 - .3 Surface work in unfinished areas: building wire in conduit.
 - .4 Armoured cable may be used where permitted by the CEC for drops to new equipment in existing gypsum board walls and ceilings.
- .2 Drops to light fixtures to be building wire in flexible conduit or armoured cable, maximum length 1.5 m.
- .3 Branch circuit wiring to be sized for a maximum voltage drop of 3% in accordance with the CEC.
 - .1 15A branch circuits to be wired with:
 - .1 #12 AWG up to 25m
 - .2 #10 AWG up to 38m
 - .3 #8 AWG up to 60m
 - .2 20A branch circuits to be wired with:
 - .1 #12 AWG up to 18m
 - .2 #10 AWG up to 30m
 - .3 #8 AWG up to 46m

3.2 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches in accordance with Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.
- .2 Support cables in accordance with Section 26 05 29 - Hangers and Supports for Electrical Systems.
- .3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors (0-1000 V).
- .4 Conductor length for parallel feeders to be identical.
- .5 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

3.3 FIELD QUALITY CONTROL

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

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results - Electrical.

2 Products

2.1 EQUIPMENT

- .1 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .2 Insulated grounding conductors: green, type RW90, copper, size as indicated.
- .3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Protective type clamps.
 - .2 Bonding jumpers, straps.
 - .3 Pressure wire connectors.

3 Execution

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, conductors, connectors, and accessories.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 Install a bonding wire in all conduits. Where EMT is used, run insulated copper ground wire in conduit.
- .7 Install internal bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw.
- .8 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

3.2 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, distribution panels, outdoor lighting.

3.3 FIELD QUALITY CONTROL

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

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 18.4-04 (R2009), Hardware for the support of Conduit, Tubing, and Cable (Bi-National Standard with UL 2239).

2 Products

2.1 SPECIFIC PURPOSE SUPPORTS

- .1 Specific purpose heat treated, spring steel fasteners to support boxes, conduit and cable from main structure, channels, and metal studs.

3 Execution

3.1 INSTALLATION

- .1 Secure equipment to poured concrete with expandable inserts.
- .2 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .3 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Strap teck cable at box location and at every 900 mm.
- .4 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .5 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .6 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.2 RESTRICTIONS

- .1 Do not use wire lashing, wood blocking, nylon or plastic strap ('Ty-Wraps') to support or secure raceways or cables.
- .2 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1, 22nd Edition.

1.3 SUBMITTALS

- .1 Provide shop drawings and product data for cabinets and splitters in accordance with Division 01 - General Requirements.

2 Products

2.1 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.
- .3 Covers with turned edges for surface-mounted pull and junction boxes.
- .4 Junction and pull boxes and associated joints and fittings located in hazardous locations are to be cast explosion proof with treaded connections to conduit and cable glands.

3 Execution

3.1 JUNCTION AND PULL BOXES INSTALLATION

- .1 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name voltage and phase or box designation as indicated.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results – Electrical.
- .2 Section 26 05 29 – Hangers and Supports for Electrical Systems.
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware, a National Standard of Canada.
 - .2 CSA C22.2 No. 30-M1986 (R2012) Explosion Proof Enclosures for use in Class 1 Hazardous Locations.

2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
 - .1 Screw-on, turned edge covers for surface mounted boxes.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.
- .5 102 mm square or octagonal outlet boxes for luminaires.

2.3 CONDUIT BOXES

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.
- .2 Cast explosion proof boxes, joints and fittings c/w threaded connections to conduit and cable glands to be used in hazardous locations in accordance with CSA 22.2 No. 30.

2.4 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.
- .5 Double split rings for AC90 terminations.

3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Provide correct size of openings in boxes for conduit and armoured cable connections. Reducing washers are not allowed.

- .3 Identify systems for outlet boxes in accordance with Section 26 05 00 - Common Work Results - Electrical.

End of Section

1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .2 CSA C22.2 No. 211.2 (R2011), Rigid PVC (Unplasticized) Conduit.
 - .3 CSA C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National Standard with ANCE NMX-J-017 & UL 514B).
 - .4 CSA C22.2 No. 30-M1986 (R2012) Explosion Proof Enclosures for use in Class 1 Hazardous Locations.

1.2 SUBMITTALS

- .1 Provide shop drawings and product data in accordance with Division 01 - General Requirements.

1.3 LOCATION OF CONDUITS

- .1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

2 Products

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Rigid pvc conduit: to CSA C22.2 No. 211.2.

2.2 CONDUIT FASTENINGS

- .1 One hole straps to secure surface conduits 50 mm and smaller. Two hole straps for conduits larger than 50 mm.

2.3 CONDUIT FITTINGS

- .1 Fittings: To CAN/CSA C22.2 No. 18.3, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits, unless indicated otherwise.
- .3 Ensure conduit bends other than factory "ells" are made with an approved bender. Making offsets and other bends by cutting and rejoining 90 degree bends is not permitted.
- .4 Connectors and couplings for EMT. Steel set-screw type, size as required.

2.4 CONDUIT SEALS

- .1 Conduit seals are to be provided where conduit systems enter an explosion proof or flame proof enclosure in accordance with CSA 22.1-12 Section 18, and CSA C22.2 No. 30.
- .2 Conduit seals are to be installed no further than 450 mm from the explosion proof or fire proof enclosure.
- .3 Threaded joints that are required to be explosion proof or flame proof are permitted to be either tapered or straight threaded provided the engaged thread count required by CSA C22.2 No. 30.
- .4 Only approved explosion proof or flame proof adaptors, unions, couplings, reducers and elbows that are not larger than the trade size of conduit will be permitted between the sealing fitting and the explosion proof or flame proof enclosure.

- .5 Explosion proof EYS for vertical conduit or ESUF with rotatable pour spout for horizontal conduit to be listed for Class 1, Zone 1 Hazardous Locations and manufactured with malleable iron construction and corrosion resistant epoxy powder coat finish. Sealing to be completed in accordance with manufacturers instructions and with sealant and fibre dams listed by an approved certification agency for use with the fitting.

2.5 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 in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene.

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 all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the certification of the components.
- .2 Surface mount conduits except in finished areas or as indicated.
- .3 Use epoxy coated rigid conduit underground, in corrosive areas, and where exposed to exterior elements.
- .4 Use rigid PVC conduit underground and buried in or under concrete slab on grade.
- .5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .6 Use explosion proof flexible connection for connection to explosion proof motors.
- .7 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .8 Minimum conduit size for lighting and power circuits: 19 mm. 12 mm conduit is acceptable for switch leg drops only where one two-wire circuit and ground is required.
- .9 Mechanically bend steel conduit over 19 mm dia.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.
- .12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.

3.4 CONDUITS THROUGH CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel.
- .2 Protect conduits from damage where they stub out of concrete. Use rigid steel conduit.
- .3 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .4 Organize conduits to minimize cross-overs.

3.5 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.6 CLEANING

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

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association, (CSA)
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

2 Products

2.1 NOT APPLICABLE

- .1 Not Applicable.

3 Execution

3.1 DIRECT BURIAL OF CABLES

- .1 After sand bed is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Make termination and splice only as indicated leaving 0.6 m of surplus cable in each direction.
 - .1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.
- .4 Underground cable splices not acceptable.
- .5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .6 Cable separation:
 - .1 Maintain 75 mm minimum separation between cables of different circuits.
 - .2 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.
 - .3 Maintain 300 mm minimum lateral and vertical separation for control cables when crossing other cables, with control cables in upper position.

3.2 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts.
 - .1 Do not pull spliced cables inside ducts.
- .2 Install multiple cables in duct simultaneously.
- .3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .5 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .6 After installation of cables, seal duct ends with duct sealing compound.

3.3 FIELD QUALITY CONTROL

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

- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests.
 - .1 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.
- .7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in Commissioning Manual.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

End of Section

1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results - Electrical.
- .2 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

2 Products

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250 V panelboards: bus and breakers rated for 10,000 A (symmetrical) minimum interrupting capacity respectively or as indicated on electrical drawings.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Tin plated aluminum bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim and door finish: baked grey enamel with concealed front bolts and hinges, NEMA 3R enclosure.
- .9 Minimum tub width of 500 mm.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Lock-on devices for emergency stop contactor and alarm branch circuits.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.4 **MANUFACTURERS**

- .1 Acceptable manufacturers:
 - .1 Schneider.
 - .2 Siemens.
 - .3 Cutler-Hammer.

3 **Execution**

3.1 **INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Mount panelboards to height specified in Section 26 05 00 – Common Work Results - Electrical or as indicated.
- .3 Connect loads to circuits.
- .4 Connect neutral conductors to common neutral bus with respective neutral identified.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE C37.13, Low Voltage AC Power Circuit Breakers Used in Enclosures.
- .2 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 5, 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 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

2 Products

2.1 MOULDED BREAKERS GENERAL

- .1 Moulded-case circuit breakers, to CSA C22.2 No. 5.
- .2 Bolt-on or moulded-case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg. C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 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. Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 Breakers are to be by the same manufacturer as the panelboard in which they are being installed.
- .7 Circuit breakers to have minimum 10 kA symmetrical rms interrupting capacity rating to match panelboard with minimum 10 kA at 208 V.
- .8 Breakers must be new, complete with original factory warranty and supplied from an authorized manufacturer's distributor.

3 Execution

3.1 INSTALLATION

- .1 Install air circuit breakers as indicated.
- .2 Connect main secondary service to line terminals of breaker.
- .3 Connect load terminals of breaker to feeders.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance Section 26 05 00 – Common Work Results - Electrical.
- .2 Check factory made connections for mechanical security and electrical continuity.
- .3 Check trip unit settings and to ensure proper working operation and protection of components.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results - Electrical.

1.2 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

2 Products

2.1 MANUAL MOTOR SWITCHES

- .1 Manual switch, 1, 2 or 3 poles as required. Mounted in CSA type 4x enclosure with quick-make, quick-break toggle switch.
- .2 Rated for 15 A at 250 V AC.
- .3 Shielded toggle with provision to be padlocked in ON or OFF positions.
- .4 Acceptable manufacturer or approved equal:
 - .1 Cutler-Hammer.
 - .2 Square D.
 - .3 Hubbell.
 - .4 Siemens.

2.2 FULL VOLTAGE MAGNETIC STARTERS

- .1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated, rapid action type, IEC AC4 rated, contactor size as follows:
 - .1 23 A for 0-10 hp.
 - .2 Bimetal motor overload protective device providing single phase protection.
 - .3 Power and control terminals.
 - .4 Wiring and schematic diagram inside starter enclosure invisible location.
 - .5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
- .2 Accessories:
 - .1 Pushbutton Selector switches: heavy duty, front cover mounted.
 - .2 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.
- .3 Acceptable manufacturer or approved equal:
 - .1 Cutler-Hammer #XT Series.
 - .2 Schneider #LE1 Series.
 - .3 Siemens #V4AB Series.
 - .4 Allen-Bradley Bulletin #112.

2.3 CONTROL TRANSFORMER

- .1 Single phase, dry type, control transformer with primary and secondary voltage as indicated, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for control circuit load plus 20% spare capacity.

2.4 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Manual switch designation label, white plate, black letters, size 1, engraved as indicated.

3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and manufacturer's instructions.
- .2 Operate switches to verify correct functioning.

End of Section

1 General

1.1 REFERENCES

- .1 Illuminating Engineering Society of North America (IESNA).
 - .1 LM-79, Photometric Measurements of Solid State Lighting Products.
 - .2 LM-80, Measuring Lumen Maintenance of LED Light Sources.
 - .3 TM-21, Projecting Long Term Lumen Maintenance of LED Light Sources.

1.2 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.3 SUBMITTALS

- .1 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
- .2 Photometric data to include: VCP Table and spacing criterion and luminaire coefficient of utilization (CU) tables.
- .3 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .4 Quality assurance submittals:
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and relamping schedule.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section Division 01 - General Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

1.5 ACCEPTABLE PRODUCTS

- .1 Luminaires described in this specification identify quality, performance criteria and other parameters, as indicated for this project. Named fixtures are acceptable with modifications and accessories, as indicated.
- .2 Fixtures from other manufacturers may be acceptable provided:
 - .1 Appearance and lighting performance are similar.
 - .2 Quality is equal or better.
 - .3 The fixture is provided with modifications and accessories to provide a complete product in keeping with the intent of the project.
 - .4 Approval in writing is obtained from the Departmental Representative to the supplier/manufacturer 5 days prior to tender closing date.

2 Products

2.1 LED DRIVERS

- .1 Power supply units including drivers:
 - .1 Minimum efficiency of 85%.
 - .2 Operate between -40°C to +50°C.
 - .3 120 V ($\pm 10\%$) input voltage; UL Class 1 or 2 output.
 - .4 Power factor greater than or equal to 0.90; total harmonic distortion less than or equal to 20%.
 - .5 Located with luminaire housing or remote as indicated.

2.2 LED MODULES

- .1 Color temperature, lumen output, colour rendering index and distribution as indicated.
- .2 Performance and life-span testing to IESNA Standards LM-79, LM-80 or TM-21 or approved equal.

2.3 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 LUMINAIRES

- .1 Luminaire to be surface mount in a fully gasketed 410 x 400 x 200 mm cast aluminum enclosure with black powder coat finish tempered glass lens with a Type 3 medium distribution, 1000mA LED driver, 39 W, 120 V, 4000 K, 70 CRI, and 6000+ lumen output and c/w integral button type photocell.
 - .1 Acceptable manufacturer or approved equal:
 - .1 Lithonia # TWH LED 30C 1000 40K T3M 120 PE DBLXD.
 - .2 Keene # 553 LED 3270 4K UNV PCB B - 6358 lumens.
 - .3 Lumark # XTOR9ARL-PC1.

2.5 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule on drawings.

3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.

3.2 WIRING

- .1 Connect luminaires to lighting circuits.

3.3 FIELD QUALITY CONTROL

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

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 31 23 00 - Excavation and Fill.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C127-88(2001), Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .2 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .3 ASTM D 1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - .4 ASTM D4253-00, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.3 DEFINITIONS

- .1 Corrected maximum dry density is defined as:
 - .1 $D = D1 \times D2 / (F1 \times D2) + (F2 \times D1)$
 - .2 $D = (F1 \times D1) + (0.9 \times D2 \times F2)$
 - .3 Where: D = corrected maximum dry density kg/m³.
 - .1 F1 = fraction (decimal) of total field sample passing 19 mm sieve
 - .2 F2 = fraction (decimal) of total field sample retained on 19 mm sieve (equal to 1.00 - F1)
 - .3 D1 = maximum dry density, kg/m³ of material passing 19 mm sieve determined in accordance with Method A of ASTM D698.
 - .4 D2 = bulk density, kg/m³, of material retained on 19 mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127.
- .4 For free draining aggregates, determine D1 (maximum dry density) to ASTM D4253 dry method when directed by Engineer.

2 Products

2.1 NOT USED

- .1 Not Used.

3 Execution

3.1 NOT USED

- .1 Not Used.

End of Section

1 General

1.1 DESCRIPTION OF WORK

- .1 The work of this Section comprises the furnishing of all labor, materials, and equipment necessary for the control of dust and other airborne pollutants or contaminants generated by the work of this project.
- .2 It is the responsibility of the Contractor to perform the entire work of this project in a manner which will reduce airborne dust to an absolute minimum and prevent the blowing of dust beyond the limits of construction area. This will require the strict observance of all control measures specified in this Section and other restrictions as may be deemed necessary by the Contractor, Departmental Representative or Owner's representative during the course of construction, including the requirement to cease operations.

1.2 DEFINITION

- .1 Dust as defined in this Section is any airborne particulate that may result from the work of this project, which includes, but is not limited to:
 - .1 Soil particles.
 - .2 Fertilizer
 - .3 Limestone.
 - .4 Soil additives.
 - .5 Sand.

1.3 RELATED SECTIONS

- .1 Section 31 23 00 - Excavation and Fill.

1.4 VEHICLE REQUIREMENTS

- .1 All trucks bringing fill materials to site and removing surplus materials from site are to have a heavy-duty tarpaulin covering the truck box, properly tied down, to prevent the spillage of materials or blowing of dust during transportation.
- .2 Vehicles not equipped with a tarpaulin will not be allowed on site.

1.5 WORK RESTRICTIONS

- .1 Contractor will be required to stop work when wind speed, or unusually dry conditions are such, that in the Contractor's, Departmental Representative's or Owner's representative's opinion, the control measures required under this Section are, or will be, unable to prevent the blowing of dust beyond the limits of the site.

1.6 AFTER WORKDAY REQUIREMENTS

- .1 During unusually dry conditions and when predicted wind speed is of a velocity, that in the Contractor's, Departmental Representative's or Owner representative's opinion will result in dust being blown beyond the limits of the site, the Contractor will continue the control measures specified in this Section throughout non-working hours, as required to prevent the blowing of dust.

1.7 PROTECTION

- .1 Protect existing fencing, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads and sidewalks to prevent accumulation of construction related debris on roads.

2 Products

2.1 MATERIALS

- .1 Fill material: In accordance with of Section 31 23 00 - Excavation and Fill.
- .2 Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by Owner's Geotechnical Engineer.

2.2 EQUIPMENT

- .1 For application of water use pressurized distributor equipped with a spray system that will ensure even distribution of controlled quantities of water with means of shut-off to avoid dumping of excess water.

3 Execution

3.1 GENERAL

- .1 Carry out work to prevent blowing dust and debris during construction.

3.2 APPLICATION

- .1 Apply water over entire area of operation in sufficient quantities to prevent blowing of dust, but not to create excess moisture that will prevent segregation of materials, or interfere with proper placement of materials. Application of water is required at all stages of work, which includes, but is not limited to, the following.
 - .1 Stripping of topsoil.
 - .2 Excavation Work.
 - .3 Grading operations.
 - .4 Placement of fill materials.
 - .5 Placement of topsoil.
 - .6 Removal of surplus materials.

3.3 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Rough grade to following depths below finish grades:
 - .1 150 mm for grassed areas.
 - .2 150mm for sod and topsoil total.
- .3 Slope rough grade away from building 1:50 minimum.
- .4 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .5 Compact fill areas to corrected maximum dry density to ASTM D698, as follows:
 - .1 85% under landscaped areas.
 - .2 95 % under paved and walk areas.
- .6 Do not disturb soil within branch spread of trees or shrubs to remain.
- .7 Remove surplus material and material unsuitable for fill, grading or landscaping off site.

End of Section

1 General

1.1 DESCRIPTION OF WORK

- .1 The work of this Section comprises the furnishing of all labor, materials, and equipment necessary for the control of dust and other airborne pollutants or contaminants generated by the work of this project.
- .2 It is the responsibility of the Contractor to perform the entire work of this project in a manner which will reduce airborne dust to an absolute minimum and prevent the blowing of dust beyond the limits of construction area. This will require the strict observance of all control measures specified in this Section and other restrictions as may be deemed necessary by the Contractor, Departmental Representative or Owner's representative during the course of construction, including the requirement to cease operations.

1.2 RELATED SECTIONS

- .1 Section 31 22 13 - Rough Grading.

1.3 DEFINITIONS

- .1 Dust as defined in this Section is any airborne particulate that may result from the work of this project, which includes, but is not limited to:
 - .1 Soil particles.
 - .2 Fertilizer
 - .3 Limestone.
 - .4 Soil additives.
 - .5 Sand.

1.4 VEHICLE REQUIREMENTS

- .1 All trucks bringing fill materials to site and removing surplus materials from site are to have a heavy-duty tarpaulin covering the truck box, properly tied down, to prevent the spillage of materials or blowing of dust during transportation.
- .2 Vehicles not equipped with a tarpaulin will not be allowed on site.

1.5 WORK RESTRICTIONS

- .1 Contractor will be required to stop work when wind speed, or unusually dry conditions are such, that in the Contractor's, Departmental Representative's or Owner's representative's opinion, the control measures required under this Section are, or will be, unable to prevent the blowing of dust beyond the limits of the site.

1.6 AFTER WORKDAY REQUIREMENTS

- .1 During unusually dry conditions and when predicted wind speed is of a velocity, that in the Contractor's, Departmental Representative's or Owner representative's opinion will result in dust being blown beyond the limits of the site, the Contractor will continue the control measures specified in this Section throughout non-working hours, as required to prevent the blowing of dust.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove unused soil amendments from site.
- .2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.
- .3 Separate waste materials and place in on site containers in accordance with Waste Management Plan.

2 Products

2.1 TOPSOIL

- .1 Topsoil for seeded areas : mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .4 Consistence: friable when moist.
 - .5 Existing topsoil is acceptable for reuse, subject to selection of material free from deleterious material.

2.2 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 Fertility: major soil nutrients present in following amounts:
 - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .6 Ph value: 6.5 to 8.0.
- .2 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in color.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to course textured if supplement is required.
- .4 Organic matter: compost Category A, B, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements if supplement is required.
- .5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.
- .6 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

- .1 Contractor is responsible for amendments to supply topsoil as specified.
- .2 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .3 Testing of topsoil will be carried out by testing laboratory paid by Contractor. Soil sampling, testing and analysis to be in accordance with Federal standards.

2.4 EQUIPMENT

- .1 For application of water use pressurized distributor equipped with a spray system that will ensure even distribution of controlled quantities of water with means of shut-off to avoid dumping of excess water.
- .2 Following final grading and seeding use only a water distribution vehicle with tires of sufficient size that any impression left by the tires can, if necessary, be repaired by a light hand raking.

3 Execution

3.1 GENERAL

- .1 Carry out work to prevent blowing dust and debris during construction.

3.2 APPLICATION

- .1 Apply water over entire area of operation in sufficient quantities to prevent blowing of dust, but not to create excess moisture that will prevent segregation of materials, or interfere with proper placement of materials. Application of water is required at all stages of work, which includes, but is not limited to, the following.
 - .1 Stripping of topsoil.
 - .2 Excavation Work.
 - .3 Grading operations.
 - .4 Placement of fill materials.
 - .5 Placement of topsoil.
 - .6 Removal of surplus materials.

3.3 PREPARATION OF EXISTING GRADE

- .1 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .2 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
- .3 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
- .4 Remove debris which protrudes more than 75mm above surface.
- .5 Dispose of removed material.
- .6 Cultivate entire area which is to receive topsoil to minimum depth of 150 mm.
- .7 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Spread topsoil in uniform layers not exceeding 150 mm.
- .2 For sodded areas keep topsoil 150 mm below finished grade.
- .3 Spread topsoil as indicated to following minimum depths after settlement.
 - .1 150 mm for seeded areas.
 - .2 150 mm for sodded areas.

3.5 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density. Leave surfaces smooth, uniform and firm against deep footprinting.

3.6 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .2 Remove surplus topsoil & dust from adjacent hard surfaces.

End of Section

1 General

1.1 SCOPE OF WORK

- .1 The work of this Section comprises the furnishing of all equipment, labour and materials necessary for the excavation, trenching and backfilling, as specified in this Section and indicated on the drawings, which includes, but is **NOT** necessarily limited to:
 - .1 Outside of building:
 - .1 All excavation, trenching, bedding, backfilling and compaction required for the work of Mechanical and Electrical Divisions.
 - .2 All excavation, as required, through compacted structural fill and/or undisturbed in-situ material for concrete aprons, including all related backfilling and compaction.
 - .3 All areas under sidewalks, pads, slabs and roadways.
 - .2 The work of this Section comprises the furnishing of all labor, materials, and equipment necessary for the control of dust and other airborne pollutants or contaminants generated by the work of this project.
 - .3 It is the responsibility of the Contractor to perform the entire work of this project in a manner which will reduce airborne dust to an absolute minimum and prevent the blowing of dust beyond the limits of construction area. This will require the strict observance of all control measures specified in this Section and other restrictions as may be deemed necessary by the Contractor, Departmental Representative or Owner's representative during the course of construction, including the requirement to cease operations.
 - .4 The requirements of the following Nova Scotia, Department of Transportation and Infrastructure Renewal Specifications are to be followed for all work relating to the material specifications for fill materials and bedding sand within the foundation walls for the Building.
 - .1 401 - Aggregate
 - .2 402 - Bedding Sand

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 29 - Health and Safety Procedures.
- .3 Section 01 35 43 - Environmental Procedures.
- .4 Section 31 22 19 - Finish Grading.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-03, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-01, 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 (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CGSB-51.20-M87, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/CGSB-51.34-M86, Vapor Barrier, Polyethylene Sheet for Use in Building Construction.

1.4 DEFINITIONS

- .1 Dust as defined in this Section is any airborne particulate that may result from the work of this project, which includes, but is not limited to:
 - .1 Soil particles.
 - .2 Fertilizer
 - .3 Limestone.
 - .4 Soil additives.
 - .5 Sand.
- .2 Rock :
 - .1 Any solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
- .3 Common excavation:
 - .1 Excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .4 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 millimeters in any dimension.
- .5 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .6 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .7 Cohesionless soil: For compaction purposes, cohesionless soil is:
 - .1 Materials having less than 20% passing 75 micrometres sieve, regardless of plasticity of fines.
- .8 Cohesive soil: For compaction purposes, cohesive soil is soil not having properties to be classified as cohesionless.
- .9 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.
 - .2 Sieve sizes to CAN/CGSB-8.1.
 - .3 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

1.5 VEHICLE REQUIREMENTS

- .1 All trucks bringing fill materials to site and removing surplus materials from site are to have a heavy-duty tarpaulin covering the truck box, properly tied down, to prevent the spillage of materials or blowing of dust during transportation.
- .2 Vehicles not equipped with a tarpaulin will not be allowed on site.

1.6 WORK RESTRICTIONS

- .1 Contractor will be required to stop work when wind speed, or unusually dry conditions are such, that in the Contractor's, Departmental Representative's or Owner's representative's opinion, the control measures required under this Section are, or will be, unable to prevent the blowing of dust beyond the limits of the site.

1.7 AFTER WORKDAY REQUIREMENTS

- .1 During unusually dry conditions and when predicted wind speed is of a velocity, that in the Contractor's, Departmental Representative's or Owner representative's opinion will result in dust being blown beyond the limits of the site, the Contractor will continue the control measures specified in this Section throughout non-working hours, as required to prevent the blowing of dust.

1.8 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only; completeness and accuracy are not guaranteed.
 - .2 Prior to commencing any excavation work, notify applicable Utility or authorities, establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.
 - .3 Confirm locations of buried utilities by careful test excavation.
 - .4 Maintain and protect from damage, water, sewer, gas, electric or other utilities encountered.
 - .5 Obtain direction of Departmental Representative before moving or otherwise disturbing utilities or structures.
 - .6 Where indicated, re-route existing lines in area of excavation.
 - .7 Pay costs for such work.
 - .8 Record in accordance with requirements of Section 01 78 00 - Closeout Submittals, locations of maintained, re-routed and abandoned underground services.
 - .9 Make good and pay for damage to any lines resulting from work.
- .2 Existing surface features:
 - .1 Protect existing surface features, which may be affected by work from damage while work is in progress and repair damage resulting from work.
 - .2 Where excavation necessitates root or branch cutting do so only under direct control of Departmental Representative.
 - .3 Provide protection around bench markers, layout markers, survey markers, geodetic monuments and signage.

1.9 COMPACTION DENSITIES

- .1 Compaction densities indicated are Standard Proctor Maximum Dry Densities.

1.10 GENERAL REQUIREMENTS

- .1 For bidding purposes include for the supply, installation and compaction of Type 5 fill from the bottom of excavation to underside of topsoil layer.

1.11 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate for disposal waste material in appropriate on-site bins in accordance with Waste Management Plan.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Ensure emptied containers are sealed and stored safely.
- .4 Divert excess aggregate materials from landfill for reuse.

2 Products

2.1 MATERIALS

- .1 Type 1 Fill: Crushed rock composed of hard sound, durable uncoated, cubical fragments of consistent quality produced from non-sedimentary bedrock or non-sedimentary boulders, to comply with the Nova Scotia Department of Transportation and Infrastructure Renewal - Aggregate, for Class 'A' material graded within the following limits:

<u>ASTM Sieve Size</u>	<u>Percent Passing</u>
31.5mm	100

- | | | |
|--|--------|----------|
| | 25.0mm | 95 - 100 |
| | 12.5mm | 50 - 83 |
| | 4.75mm | 30 - 60 |
| | 1.18mm | 15 - 40 |
| | 600mm | 10 - 32 |
| | 300mm | 5 - 22 |
| | 75mm | 3 - 9 |
- .2 Type 3 Fill: imported, classified as Common Fill, or material from excavation or other sources, approved by Consultant for use intended, unfrozen, free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Type 4 Fill: natural sand or crushed rock screening, free from clay, shale or organic matter, to comply with Nova Scotia Department of Transportation and Infrastructure Renewal - Bedding Sand, graded with the following limits:
- | | | |
|----|------------------------|------------------------|
| .1 | <u>ASTM Sieve Size</u> | <u>Percent Passing</u> |
| | 9.5mm | 100 |
| | 4.75mm | 87 - 98 |
| | 2.36mm | 55 - 95 |
| | 1.18mm | 30 - 90 |
| | 600mm | 10 - 70 |
| | 300mm | 0 - 35 |
| | 150mm | 0 - 15 |
| | 75mm | 0 - 8 |
- .4 Type 5 Fill: to requirements of Nova Scotia, Department of Transportation and Infrastructure Renewal Select Borrow as follows:
- .1 Borrow shall be non-plastic and composed of clean, uncoated particles free from lumps of clay or other deleterious material with a maximum particle size of 100mm, and a maximum of 30% of the material passing the 4.75 sieve shall pass the 0.075 mm sieve.
- .5 Type 6 Fill: clean, washed coarse sand free from clay, shale and organic matter and graded within the following limits:
- | | | |
|----|-------------------|------------------------|
| .1 | <u>Sieve Size</u> | <u>Percent Passing</u> |
| | 12.5mm | - 100 |
| | 4.75mm | 90 - 100 |
| | 0.85mm | 40 - 100 |
| | 0.35mm | 0 - 75 |
| | 0.25mm | 0 - 38 |
| | 0.75mm | 0 - 8 |
- .6 Filter Fabric
- .1 Filter light-weight, non-woven polypropylene fiber fabric, needle punched and heat set.

2.2 EQUIPMENT

- .1 For application of water use pressurized distributor equipped with a spray system that will ensure even distribution of controlled quantities of water with means of shut-off to avoid dumping of excess water.
- .2 Following final grading and seeding use only a water distribution vehicle with tires of sufficient size that any impression left by the tires can, if necessary, be repaired by a light hand raking.

3 Execution

3.1 GENERAL

- .1 Carry out work to prevent blowing dust and debris during construction.

3.2 APPLICATION

- .1 Apply water over entire area of operation in sufficient quantities to prevent blowing of dust, but not to create excess moisture that will prevent segregation of materials, or interfere with proper placement of materials. Application of water is required at all stages of work, which includes, but is not limited to, the following.
 - .1 Stripping of topsoil.
 - .2 Excavation Work.
 - .3 Grading operations.
 - .4 Placement of fill materials.
 - .5 Placement of topsoil.
 - .6 Removal of surplus materials.

3.3 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Remove concrete and other obstructions encountered during excavation.
- .3 Excavation must not interfere with normal 45° bearing splay of adjacent foundations.
- .4 Following completion of excavation work and prior to placement of any structural fill material proof roll existing sub-grade exposed by excavation with a large vibratory roller (CAT CS-563E or equivalent). Remove 'soft' material and replace with new structural fill in accordance with requirements of this Section compacted to 100% density.
- .5 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Dispose of surplus and unsuitable excavated material in approved location on site.
- .8 Earth bottoms of excavations to be undisturbed soil, dry, level, free from loose, soft or organic matter.
- .9 Notify Departmental Representative when bottom of excavation appears unsuitable.
- .10 Obtain Departmental Representative approval of completed excavation.
- .11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .12 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.

3.4 FILL TYPES AND COMPACTION

- .1 Dimensions specified in following paragraphs are minimum dimensions of fill after compaction.
- .2 Underground services:
 - .1 Use Type 4 Fill (bedding sand) to provide bedding and cover as indicated compacted full width of trench to minimum 95% density.
 - .2 Use Type 3 Fill to underside of topsoil at landscaped areas compacted to density at least equal to adjacent undisturbed soil or minimum 95%.

3.5 BEDDING AND SURROUND OF UNDERGROUND SERVICES

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

3.6 BACKFILLING

- .1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved installations.
- .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 Backfilling around perimeter foundation walls.
 - .1 Do NOT place fill material against perimeter foundation walls until:
 - .1 Concrete has cured for a minimum of 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval has been obtained from

- .2 Departmental Representative.
- .2 Floor structures are permanently in place, unless approved by Departmental Representative.
- .3 Exercise care not to damage insulation at interior face of foundation walls and polyethylene slip sheet at exterior face of the foundation walls.
- .5 Backfilling around site installations.
 - .1 Place bedding and surround material as specified and indicated in applicable Section for service or utility to be installed.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
 - .3 Place layers simultaneously on both sides of installed work to equalize loading.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum of 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval has been obtained from Departmental Representative or:
 - .2 If approved by Departmental Representative erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
 - .5 Place material by hand under, around and over installations until 600mm of cover is provided, except where specifically permitted otherwise. Dumping material directly on installations will not be permitted.
 - .6 Place backfill material in uniform layers not exceeding 150mm up to grades indicated. Compact each layer before placing succeeding layer. Use methods to prevent damage to installations.

3.7 RESTORATION

- .1 Upon completion of work, remove surplus materials and debris, trim slopes and correct defects noted by Departmental Representative.
- .2 Clean and reinstate areas affected by work to satisfaction of Departmental Representative.

3.8 SUPRLUS MATERIAL

- .1 Remove all surplus material from site, and pay all fees as may be charged at disposal site.
- .2 Remove all soil contaminated with oil, gasoline, calcium chloride or other toxic or dangerous materials resulting from the work of this contract and dispose of in manner to minimize danger at site and in a manner and to a location off site approved by Authorities having jurisdiction of such disposal.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 29 - Health, Safety and Emergency Response Procedures.
- .3 Section 03 30 00 - Cast-in-Place Concrete.

1.2 DESCRIPTION OF WORK

- .1 The work of this Section comprises the furnishing of all labor, materials, and equipment necessary for the supply and installation of the items of work specifically listed under Part 2 - PRODUCTS of this Section, as specified in this Section and shown on the Drawings.

2 Products

2.1 PIPE BOLLARDS

- .1 Fabricate from HSS Round, Grade 350 W to size indicated c/w anchor lugs.
- .2 Prime paint ready for finish painting.
- .3 Concrete to CSA A23.1 and CSA A 23.2. Min compressive strength = 25 MPa at 28 days for installation in concrete bases.

3 Execution

3.1 INSTALLATION OF BOLLARDS

- .1 Install posts to details and as indicated and specified herein.
- .2 Excavate post holes, compact bottom of hole to provide firm foundation. Set post plumb and centered in concrete. Provide slip sheet around entire concrete base. Backfill with excavated material in 150 mm layers. Compact each layer before placing succeeding layer.
- .3 Apply one coat steel primer CGSB 1-GP-40M and two coats exterior enamel CGSB 1-GP-59M (colour as approved by owner).
- .4 Complete backfilling around posts to ground elevation when paint is dry.

End of Section

1 General

1.1 SCOPE OF WORK

- .1 Work includes the supply installation and maintenance of sodding as specified and as shown on the drawings.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 31 22 19 - Finish Grading.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit MSDS sheets for all products

1.4 QUALITY ASSURANCE

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.5 SCHEDULING

- .1 Schedule sod laying to coincide with preparation of soil surface.
- .2 Schedule sod installation when frost is not present in ground.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Waste Management Plan.
- .2 Divert unused fertilizer from landfill to official hazardous material collections site.
- .3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

2 Products

2.1 MATERIALS

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 - .1 Turf Grass Nursery Sod types:
 - .1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing rescue or Creeping Red rescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
 - .2 Turf Grass Nursery Sod quality:
 - .1 Not more than 2 broad leaf weeds or 10 other weeds per 40 square meters.
 - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
 - .3 Mowing height limit: 35 to 65 mm.
 - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .3 Sod establishment support;
 - .1 Geotextile fabric: biodegradable, 100 mm square mesh.
 - .2 Wooden pegs: 17 x 8 x 200mm.
 - .3 Biodegradable starch pegs: 17 x 8 x 200 mm.
- .4 Water:
 - .1 Potable
- .5 Fertilizer:

- .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
- .2 Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.
- .6 Limestone:
 - .1 Ground agricultural limestone containing minimum 85% of total carbonates.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0mm sieve, 50% passing 0.125mm sieve.

2.2 SOURCE QUALITY CONTROL

- .1 Obtain approval from Consultant of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Consultant.

3 Execution

3.1 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 31 22 19 - Finish Grading. If discrepancies occur, notify Consultant and do not commence work until instructed by Consultant.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, to contours, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

3.2 SOD PLACEMENT

- .1 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Roll sod as directed by Consultant. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.3 SOD PLACEMENT ON SLOPES AND PEGGING

- .1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.
- .2 Start laying sod at bottom of slopes.
- .3 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:
 - .1 100 mm below top edge at 200 mm on center for first sod sections along contours of slopes.
 - .2 Not less than 3-6 pegs per square meter.
 - .3 Not less than 6-9 pegs per square meter in drainage structures. Adjust pattern as directed by Consultant.
 - .4 Drive pegs to 20 mm above soil surface of sod sections.

3.4 FERTILIZING PROGRAM

- .1 Apply fertilizer at nitrogen rate of 500 g/100 m² or at a rate determined by soil analysis.

3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of installation until acceptance:
 - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
 - .2 Cut grass to 50 mm when or prior to it reaching height of 75 mm. Remove clippings which

- will smother grassed areas as directed by Consultant.
- .3 Maintain sodded areas weed free 95%.
- .4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

3.6 ACCEPTANCE

- .1 Turf Grass Nursery Sod areas will be accepted by Consultant provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots.
 - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
 - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .2 Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by Consultant provided that:
 - .1 Sodded areas are properly established.
 - .2 Extent of surface soil visible when grass has been cut to height of 60 mm is acceptable.
 - .3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.
 - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
 - .5 Fertilizing in accordance with fertilizer program has been carried out at least once.
- .3 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.7 MAINTENANCE DURING WARRANTY PERIOD

- .1 Perform following operations from time of acceptance until end of warranty period:
- .2 Repair and resod dead or bare spots to satisfaction of Consultant.

3.8 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

End of Section

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA).
 - .1 CSA C22.2 No. 211.1, Rigid Types EBI and DB2/ES2 PVC Conduit.

2 Products

2.1 DUCTS AND FITTINGS

- .1 Use epoxy coated galvanized steel conduit for sections extending above finished grade and where indicated.

2.2 CABLE PULLING EQUIPMENT

- .1 Use 6 mm stranded nylon pull rope tensile strength 5 kN.

2.3 MARKERS

- .1 150 mm wide, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings.

3 Execution

3.1 INSTALLATION

- .1 Install duct in accordance with manufacturer's instructions.
- .2 Clean inside of ducts before laying.
- .3 Ensure full, even support every 1500 mm throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 During construction, cap ends of ducts to prevent entrance of foreign materials.
- .6 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct.
- .7 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.
- .8 Install markers as required.

End of Section