

Fisheries and Oceans Canada

Bamfield Lifeboat Station Fuel System Upgrade

Specifications

DFO Project No. F5211-130409

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| Section No. | | No. of Pages |
|--------------------|---|---------------------|
| 01 00 50 | General Instructions (revised 2014/02/05)..... | 6 |
| 01 33 00 | Submittal Procedures | 3 |
| 01 35 29.06 | Health and Safety Requirements..... | 2 |
| 01 35 43 | Environmental Procedures | 2 |
| 01 73 03 | Execution Requirements | 2 |
| 01 74 19 | Waste Management and Disposal | 2 |
| 02 41 17 | Structure Demolition – Short Form | 1 |
| 02 65 00 | Fuel Storage Tank Removal..... | 5 |
| 03 10 00 | Concrete Forming and Accessories | 3 |
| 03 20 00 | Concrete Reinforcing | 2 |
| 03 30 05 | Cast-in-Place Concrete – Short Form | 4 |
| 23 11 14 | Fuel System Piping | 4 |
| 26 05 00 | Common Work Results – Electrical | 7 |
| 26 05 21 | Wires and Cables (0-1000V) | 4 |
| 26 05 28 | Grounding – Secondary | 4 |
| 26 05 29 | Hangers and Supports for Electrical Systems | 2 |
| 26 05 31 | Splitters, Junctions, Pull Boxes and cabinets..... | 2 |
| 26 05 34 | Conduits, Conduit Fastenings and Conduit Fittings | 4 |
| 26 05 43.01 | Installation of Cables in Trenches and in Ducts | 4 |
| 26 24 16.01 | Panelboards Breaker Type | 3 |
| 26 29 01 | Contactors | 2 |
| 26 29 03 | Control Devices | 3 |
| 26 56 01 | Lighting..... | 3 |
| 33 56 14 | Aboveground Fuel Storage Tanks | 1 |

List of Drawings

| Drawing No. | Title |
|--------------------|--------------------------------------|
| Cover Sheet | Location Plan and Site Plan |
| M-01 | Site Layout and Piping Details |
| E-01 | Site Plan, Grounding Grid and Legend |
| E-02 | Single Line Diagram |
| E-03 | Lighting Details and Trench Section |

Part 1 General

1.1 DESCRIPTION OF WORK

- .1 Work under this Contract covers: The construction of upgrades to the fuel system for fuel dispensing and heating fuel transfer at the Bamfield Lifeboat Station in Bamfield, BC.
- .2 .2 The work shall include the supply of labour, materials, and equipment to install a DFO supplied 13,600L split compartment Aboveground Storage Tank (AST) and remove a 9,100L steel AST. It will be the contractor's responsibility to ensure all of the works shown on the drawings and specifications are complete in every respect. The following generally describes the work to be done and materials to be supplied.
- .3 .3 Removal of the following systems:
 - .4 One 9,100L, double wall, steel, ULC-S601, AST (remove, destroy and dispose).
 - .5 One tank mounted dispensing pump and associated valve, hose and nozzle. (leave with owner).
- .6 .4 Supply and installation of the following system:
 - .7 One concrete tank pad with containment curb, catch basin and piping to the existing oil water separator.
 - .8 Install only: one owner supplied 13,600L, double wall, steel, ULC-S601, split compartment AST with stairs and 2-Morrison Bros. 918 clock gauges. Contractor to provide shipping of the tank and stairs from Regal Tanks in Chilliwack BC to the site in Bamfield.
 - .9 Two submerged turbine pumps with electrical connections.
 - .10 One lockable aluminum fuelling cabinet for gasoline c/w dispensing hose with inline meter, power driven hose reel and associated piping, valves and fittings.
 - .11 Remove and reinstall one existing, lockable, aluminum fuelling cabinet for diesel c/w dispensing hose with inline meter, power driven hose reel and associated piping, valves and fittings.
 - .12 Underground fuel transfer piping with one transition sump and connection to one existing underground sump c/w all associated fittings.
 - .13 All associated valves, piping, supports and fittings from the transition sump to the AST and from the AST to the fuelling cabinets.
 - .14 Pressure testing of all pipe work and leak test of the transition sump.
 - .15 All electrical works associated with the new pumps, hose reels, emergency shut down and fuel area lighting, including tank and fuel area grounding.
 - .16 The contractor is responsible to supply and install all components to construct a complete working system as indicated on the contract drawings and the specifications.

1.2 GENERAL REQUIREMENTS

- .1 Perform Work in accordance with the most current edition of the:
 - .1 National Building Code.
 - .2 National Fire Code.
 - .3 National Electrical Code.

- .4 Installation Code for Oil Burning Equipment CAN/CSA-B139.
- .5 Canadian Environmental Protection Act
- .6 Canadian Labour Code Part II, WorkSafe BC, Occupational Health and Safety and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 The fuel system will be installed by a person approved to do so by the province of BC, as per CEPA – Storage Tank Systems for Petroleum Products and Allied Petroleum Product Regulation Section 33 and the “the existing storage tank system will be removed by a person approved to do so by the province of BC, as per CEPA – Storage Tank Systems for Petroleum Products and Allied Petroleum Product Regulation Section 45.
- .3 All work shall be performed in strict accordance with the drawings and specifications. If any conflicts exist, the drawings will prevail and the Engineer shall be contacted immediately.
- .4 Contractor shall obtain all required permits and be solely responsible for construction means, methods, techniques, sequences and procedures and for coordinating the various parts of the work.
- .5 During the construction period the Contractor shall be responsible for the safety of the designated construction areas. The Contractor shall provide adequate shoring, bracing, and guys in accordance with all Federal, Provincial, and Municipal Safety Regulations, as well as all requirements of the Occupational Health and Safety Regulations of British Columbia.
- .6 The Contractor shall be responsible for coordinating the work of all trades and shall check all dimensions. All discrepancies shall be called to the attention of the Owner’s Representative and be resolved before proceeding with the work.
- .7 Shop Drawings required by the specifications shall be submitted to the FOC Project Engineer for review prior to fabrication.
- .8 Mechanical, civil and electrical drawings indicate size and location for all openings required for ducts, pipes and all pipe sleeves, electrical conduits and other items to be embedded in concrete or otherwise incorporated in structural work. All discrepancies shall be brought to the attention of the FOC Project Engineer and be resolved before proceeding with the work.
- .9 Provide openings and supports, as required per details for, mechanical equipment, vents, ducts, pipes, etc. All suspended mechanical equipment to be sway or laterally braced.
- .10 All information shown on the drawings relative to existing conditions is given as the best present knowledge, but without guarantee of accuracy. Where actual conditions conflict with the drawings they shall be reported to the Engineer so that the proper revisions may be made. Modifications of details of construction shall not be made without written approval of the Engineer. Where information on contract drawings conflicts with information given in this specification, the drawing information will prevail.
- .11 Location of equipment, fixtures, and outlets indicated or specified are to be considered as approximate. All suspended mechanical equipment to be sway or laterally braced.
- .12 The Engineer will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.
- .13 All work at this project shall be by this Contractor. Where it is noted “by others”, the work will take place after the project is completed by this Contractor.

1.3 LAYOUT OF THE WORK

- .1 The Contractor shall be responsible for the layout of the work and shall assume full responsibility for the alignment, dimensions and elevations of each and every part of the Work and their mutual relationship.

1.4 SECURITY AND CONSTRUCTION SAFETY

- .1 Security:
 - .1 The Contractor shall be responsible for security and safety of the project site at all times for the duration of the Contract. This is to protect all associate workers, FOC representatives and all authorized personnel at the Place of Work during the construction period.
- .2 Construction Safety:
 - .1 Refer to Technical Requirements Section 01 35 29.06 Health and Safety Requirements

1.5 EMERGENCIES

- .1 Unusual conditions may arise on the site, which will require that immediate and Unusual action be taken to protect the public from danger or loss or damage to life or property due directly or indirectly to the execution of the work, and it is part of the service required of the Contractor to make such provisions and to furnish such protection. Whenever, in the opinion of FOC or their Engineer, an emergency exists against which the Contractor has not taken sufficient precaution for the safety of the public or the protection of utilities or of adjacent structures or properties which may be injured by process of construction on account of such neglect, and whenever, in the opinion of FOC, immediate actions shall be necessary in the public interest, FOC may take such action as is necessary to safeguard the public interest.
- .2 All costs involved in the above requirements will be properly chargeable to the Contractor and may, if necessary, be deducted from any sums due or which may become due to the Contractor under the terms of the Contract.
- .3 The Contractor shall save harmless and indemnify FOC in respect of all claims for damages arising out of, or in relation to, any such matters.

1.6 QUALITY CONTROL

- .1 All quality control and testing services connected with new construction work shall be carried out as required by the specifications using the Contractor's registered Quality Control manual and procedures. The cost of supplying and delivering of all test samples and the cost of testing will be borne by the Contractor except as stipulated in the specifications. Retesting of rejected work or tests, which fail to meet specification requirements, shall be borne by the Contractor. The minimum requirements for testing are as stipulated in the respective technical specifications of this document and/or within the drawings forming part of the construction documents. Parties independent of the Contractor shall perform testing and reporting. When deemed necessary by the DFO Representative.

1.7 RIGHT-OF-WAY AND RIGHT-OF-ACCESS

- .1 The Contractor shall ensure that no equipment with lugs or cleats travels on any paved or planted areas. It shall be the Contractor's responsibility to repair any damages to paved or planted areas caused by his construction equipment and/or operation as deemed by DFO.

- .2 DFO will, with the notice to proceed, give to the Contractor possession of as much of the site as may be required to enable the Contractor to commence and proceed with the Work.
- .3 Work hours are limited to 7:00 am until 4:00 pm Monday through Sunday or at the discretion or permission of the DFO site staff.
- .4 Deliveries of supplies, equipment and/or materials to the site of the Work shall be on routes designated by DFO.
- .5 The driveway area will be used by others throughout project and must be maintained free of construction debris and materials at all times.
- .6 The Contractors' equipment and vehicles must not be parked, stored or positioned in the driveway area where they will obstruct traffic.
- .7 Employee parking and non-working hour storage of equipment shall be arranged for by the Contractor with DFO site staff.

1.8 PREVENTION OF WATER POLLUTION

- .1 The Contractor's construction activities shall be performed by methods that will prevent entrance or accidental spillage of contaminants, debris and other objectionable pollutants and wastes.
- .2 Any dewatering pumping which must be employed, and any water used in tank or line testing shall be discharged to an authorized discharge location as designated by DFO.
- .3 Any accidental spills of contaminants listed by the Provincial Waste Management Act shall be reported as required by the legislation.
- .4 Refer to Section 01 35 43.

1.9 TEMPORARY FACILITIES

- .1 Furnished by Contractor:
 - .1 The Contractor shall be responsible for connection and disconnection of temporary power, water and communication systems, as noted below and in paragraph 1.9.2 Contractor shall, as a part of work, supply, install, properly maintain and remove all temporary construction facilities and utilities necessary for full and complete performance of the Work. Such items shall include, but not necessarily be limited to, those listed below. The type of facilities, move-in and move-out dates and locations on job site shall be subject to and in accordance with, the review and approval of the Owner
 - .1 First aid facilities
 - .2 Fuels and lubricants including heating fuels
 - .3 Transportation facilities, on and off the site
 - .4 Telephone services
 - .5 Compressed air and gases
 - .6 Maintenance of Contractor's letdown, storage and work areas and roads within such areas including lockup area for material storage
 - .7 All cranes and other necessary equipment for lifting and moving equipment
 - .8 Non-destructive testing equipment
 - .9 All small tools
 - .10 Temporary lighting
 - .11 All standard expendable or consumable construction items and supplies
 - .12 All temporary buildings for use by the Contractor's employees
 - .13 Construction power (See 1.9.2 – "Furnished By Owner")

- .14 Storage facilities for heavy equipment
 - .15 Washroom facilities
 - .16 All items not supplied by the Owner
- .2 Furnished by Owner
- .1 Contractor's lay down area shall be restricted to the immediate area of the Work which will be defined by the DFO Representative.
 - .2 Security for the storage of instruments and small tools will be the Contractor's responsibility.
 - .3 Electrical Power is available in the areas of work.

1.10 CONTRACTOR'S OFFICE

- .1 The Contractor shall provide a trailer on-site for this purpose, if required.

1.11 PROTECTION OF EXISTING WORKS

- .1 The Contractor shall be responsible for protection and maintenance of all existing works, property and facilities in or adjacent to the place of the work. The Contractor shall be responsible for the provision and removal and cost for all necessary temporary works required to maintain existing facilities.
- .2 The Contractor shall be responsible for any damage or loss resulting to existing works from his activities. He shall repair or replace immediately at his cost any loss or damage to the satisfaction of FOC.
- .3 The Contractor shall be responsible for the determination of the existence of all on-site utilities including sewer, water, electrical and natural gas services at the project site. The Owner will provide all available drawings to assist, however it will be the Contractor's responsibility to contact the applicable agency for any on-site confirmation of utilities.

1.12 PERMITS AND REGULATIONS

- .1 The following permit applications have been made by DFO:
 - .1 Approval authority for the project by the Dominion Fire Commissioners Office.
 - .2 All other legislated construction requirements shall be the responsibility of the Contractor to maintain compliance as required.

1.13 CONFIDENTIALITY

- .1 The Contractor shall treat as confidential, all information regarding the design of the Work and FOC's operating policies and procedures. The Contractor shall not divulge any such information to parties not directly associated with the Work except as necessary for the execution of the Work.

1.14 PERFORMANCE SCHEDULE

- .1 The Contractor shall commence performance of the Work after receiving instructions to proceed from FOC. FOC will promptly thereafter confirm the date of commencement in writing.
- .2 To perform the Work satisfactorily, the Contractor shall mobilize in order to commence work within two weeks of the formal award of Contract.
- .3 The Contractor shall provide FOC with a construction schedule (bar graph) one week prior to commencing work at the site.

1.15 REPORTING REQUIREMENTS

- .1 The Contractor shall submit the following schedules and reports to the Owner's Representative:
- .2 Construction schedule prior to start of construction
- .3 Receipt documents for all equipment supplied by DFO and delivered to site to the custody of the Contractor plus a statement of any damage to the equipment at the time of receipt. Contractor must advise DFO immediately of any damage to allow for prompt damage claims to be made.
- .4 Maintain a record of all on-site inspections including the agency/company, name of inspector and date of inspection.
- .5 Accidents and unsafe work conditions will be reported immediately with a full written report describing the incident/condition and all remedial action taken.
- .6 All reports relating to quality control and testing of materials and systems as required in the specifications.

1.16 PROJECT RECORD DOCUMENTS

- .1 The Contractor shall maintain the following documents at the construction site at all times:
 - .1 Contract Documents listed under the Agreement;
 - .2 WCB Industrial Health and Safety Regulations (latest edition);
 - .3 Construction change orders; and
 - .4 One set of drawings and specifications dedicated to annotating changes and which will be the basis of a set of "as-built" drawings at the project completion.
 - .5 Upon completion of work, submit final record drawings to the DFO Representative.

1.17 MATERIAL AND EQUIPMENT SUPPLIED BY OWNER

- .1 1 – 13,600L, Double wall, Steel, ULC-S601 split compartment AST. (shop drawings available)
- .2 2 – Morrison Bros. Model 918 tank level gauges.

1.18 MATERIAL AND EQUIPMENT SUPPLIED BY CONTRACTOR

- .1 All construction materials noted on the drawing and in the specifications with the exception of those items noted in 1.17 above.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 This section specifies general requirements and procedures for Contractor's submissions of shop drawings, product data, samples, and mock-ups to Engineer for review. Additional specific requirements for submissions are specified in individual sections.
- .2 Do not proceed with Work until relevant submissions are reviewed by Engineer.
- .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 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submissions.
- .6 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer's review of submission, unless Engineer gives written acceptance of specific deviations.
- .8 Make any changes in submissions which Engineer may require consistent with Contract Documents and resubmit as directed by Engineer.
- .9 Notify Engineer, in writing, when resubmitting, of any revisions other than those requested by Engineer.
- .10 Engineering costs may be charged to the Contractor where documents are resubmitted without all changes required by the Engineer.

1.2 SUBMISSION REQUIREMENTS

- .1 Coordinate each submission with requirements of Work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .2 Allow 14 days for Engineer's review of each submission.
- .3 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data, and sample.
 - .5 Other pertinent data.
- .4 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Identification of product or material.
 - .5 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements, and compliance with

- Contract Documents.
- .6 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.
- .5 After Engineer's review, distribute copies.
- .6 Submissions not meeting the requirements of this section will be returned to the contractor without review for resubmission.

1.3 LIMITATIONS OF REVIEW

- .1 The Engineer shall review Contractor submittals, such as shop drawings, product data, samples and other data, as required by the Engineer, but only for the limited purpose of checking for general conformance with the design concept and the information expressed in the Contract Documents. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction of safety precautions, all of which are the sole responsibility of the Contractor. The Engineer's review shall be conducted with reasonable promptness while allowing sufficient time in the Engineer's judgment to permit adequate review. Review of a specific item shall not indicate that the Engineer has reviewed the entire assembly of which the item is a component. The Engineer shall not be responsible for any deviations from the Contract Documents not brought to the attention of the Engineer in writing by the Contractor. The Engineer shall not be required to review partial submission or those for which submission of correlated items have not been received.

1.4 SHOP DRAWINGS

- .1 Submit original drawings, or modified standard drawings to illustrate details of portions of Work, which are specific to project requirements.
- .2 Maximum sheet size: 850 x 1,050 mm.
- .3 Submit shop drawings as follows:
 - .1 Opaque diazo prints, photocopies, or PDF copies of the original manufacturer's information.
 - .2 Number Contractor requires for distribution plus 3 copies to be retained by Engineer.
- .4 Cross-reference shop drawing information to applicable portions of Contract Documents.

1.5 PRODUCT DATA

- .1 Certain Specification Sections specify that manufacturer's catalogue sheets, brochures, literature, performance charts and diagrams, and other standard descriptive data used to illustrate standard manufactured products will be accepted in lieu of shop drawings.

- .2 Submit 3 copies of product data.
- .3 Show dimensions and clearances required.
- .4 Delete information not applicable to project.
- .5 Supplement standard information to provide details applicable to project.
- .6 Show performance clearances required.
- .7 Show wiring diagrams and controls.
- .8 Cross-reference product data information to applicable portions of Contract Documents.

1.6 SAMPLES

- .1 Samples: examples of materials, equipment, quality, finishes, workmanship.
- .2 Where colour, pattern, or texture is criterion, submit full range of samples.
- .3 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Health and safety considerations required to ensure that DFO shows due diligence towards health and safety on construction sites, and meets the requirements laid out in PWGSC/RPB Departmental Policy DP 073 - Occupational Health and Safety - Construction.

1.2 RELATED SECTIONS

- .1 Section 02 65 00 – Fuel Storage Tank Removal

1.3 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 British Columbia
 - .1 Workers Compensation Act, RSBC 1996 - Updated 2006.

1.4 SUBMITTALS

- .1 Submit copies of reports or directions issued by Federal, Provincial/Territorial, and local health and safety inspectors.
- .2 Submit copies of incident and accident reports.

1.5 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

1.6 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 COMPLIANCE REQUIREMENTS

- .1 Comply with current Occupational Health & Safety Regulations for BC.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.8 UNFORSEEN 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 the Province having jurisdiction and advise DFO Representative verbally and in writing.

1.9 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with tank destructions and removal.
 - .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.

1.10 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 British Columbia, and in consultation with DFO Representative.

1.11 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by DFO Representative.
- .2 Provide DFO Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 DFO Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.12 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.

END OF SECTION

Part 1 General

1.1 GENERAL INSTRUCTIONS

- .1 The General Instructions shall form part of this section.
- .2 Be fully familiar with all aspects of the permits required for construction of the proposed works, as well as requirements stipulated by the Owner. All works shall be constructed in accordance with these permits and Owner requirements.

1.2 FIRES

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

1.3 ARCHAEOLOGICAL PROTECTION

- .1 All First Nations artifacts and remains of First Nations settlements are protected whether found on the ground surface or buried beneath the surface. All such remains and deposits are not to be disturbed until their significance has been assessed by an archaeologist to the satisfaction of the Engineer.

1.4 HAZARDOUS MATERIALS HANDLING AND STORAGE

- .1 Hazardous materials including, but not limited to fuels, bitumen, cement, paints, solvent, cleaners, dust suppressants, used fuel and oil filters, and other construction materials shall be stored and handled to minimize loss and allow contaminant and recovery in the event of a spill.
- .2 Designate areas for the transfer and temporary storage of hazardous materials and wastes. The areas shall be clearly labelled and appropriately controlled. The designated areas shall be used by the contractor as a transfer and temporary storage area for potentially hazardous materials and wastes.
- .3 Maintain proper WHMIS labels and MSDS for all hazardous materials used and stored on site.

1.5 SPECIAL AND GENERAL WASTE, RUBBISH, AND GARBAGE

- .1 Special wastes generated in the course of the construction activities shall be disposed of in compliance with the BC Special Waste Regulation. As defined by these regulations, special waste includes but is not limited to waste asbestos, oils, grease, lubricants, solvents, batteries, PCB's, paints, and used spill clean-up materials.
- .2 When handling, storing and removing Special Waste, the Contractor shall maintain the following records: Inventories of types and quantities of Special Wastes generated, stored or removed; manifests identifying special waste haulers and disposal destinations; and, disposal certification documents.
- .3 Non-hazardous solid wastes such as but not limited to, waste wood, asphalt, concrete, and metals shall be disposed of at an approved disposal facility in compliance with the B.C. Waste Management Act.
- .4 Establish regular clean up and disposal programs so as to prevent the excessive accumulation of solid waste and contain all garbage related to the project.
- .5 Do not bury rubbish and waste materials on site.

1.6 SPILL PREVENTION AND EMERGENCY RESPONSE

- .1 The Owner will provide procedures for spill response and emergency contact information.
- .2 Complete a daily visual inspection of all hazardous material and equipment for signs of leakage. Daily visual inspection will include, among other things ensuring that all protective equipment and other emergency response equipment is in its place.
- .3 Maintain a readily available supply of emergency spill response material and equipment, on site at all times, in effective working condition appropriate to the scale of the project.
- .4 Immediately deal with any spills which occur.
- .5 Report any environmental incident or spill/release of a substance to the Engineer and the Owner.

END OF SECTION

Part 1 General

1.1 MANUAL

- .1 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 Divisions 02 to 33.

1.2 GENERAL INSTRUCTIONS

- .1 Assemble, coordinate, bind, and index required data into Operation and Maintenance Manual.
- .2 Submit four (4) copies of complete operation and maintenance manual to Engineer upon project completion.
- .3 Material: label each section with tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .4 Type lists and notes.
- .5 Drawings, diagrams, and manufacturer's literature must be legible.

1.3 BINDERS

- .1 Binders: vinyl, hard covered, 3 "D" ring, loose leaf, sized for 215 x 280 mm paper, with spine pocket.
- .2 Identify contents of each binder on spine.

1.4 CONTENTS

- .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location, and project number.
 - .3 Names and addresses of Contractor and all subcontractors.
- .2 Table of Contents of all binders.
- .3 List of maintenance materials provided.
- .4 List of special tools provided.
- .5 List of spare parts provided.
- .6 Warranties, guarantees.
- .7 Copies of approvals and certificates.

1.5 PRODUCT DATA

- .1 Provide data as specified in individual sections of Divisions 02 to 33.
 - .1 List of equipment including service depot.
 - .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.
- .2 Shop drawings:
 - .1 One complete set of reviewed final shop drawings and product data.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Refer to every technical section for waste management and disposal requirements.

1.2 DEFINITIONS

- .1 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, re-use or recycling of materials.
- .2 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate re-usable and recyclable waste material into material categories from other types of waste at point of generation.

1.3 MATERIALS SOURCE SEPARATION

- .1 Before project start-up, prepare MSSP. Provide separate containers for re-usable and/or recyclable materials of following:
 - .1 Gypsum board.
 - .2 Metal.
 - .3 Wood.
 - .4 Paint.
 - .5 Other materials as indicated in technical sections.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as approved by Departmental Representative.
- .3 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .4 Locate separated materials in areas which minimize material damage.

1.4 DIVERSION OF MATERIALS

- .1 Create list of materials to be separated from general waste stream and stockpiled in separate containers, to approval of Departmental Representative and consistent with applicable fire regulations.
 - .1 Mark containers.
 - .2 Provide instruction on disposal practices.

1.5 STORAGE, HANDLING AND APPLICATION

- .1 Do work in compliance with Departmental Representative approved WRW.
- .2 Handle waste materials not re-used, salvaged or recycled in accordance with appropriate regulations and codes.
 - .1 Place used asphaltic, bituminous, adhesive and solvent material containers in areas designated for hazardous materials.
 - .2 Place sealant tubes in areas designated for hazardous materials.

- .3 Materials in separated condition: collect, handle, store on site and transport off-site to approved and authorized recycling facility.
- .4 Materials must be immediately separated into required categories for re-use or recycling.
- .5 Unless specified otherwise, materials for removal become Contractor's property.
- .6 On-site sale of salvaged/recyclable material is not permitted.
- .7 Provide Departmental Representative with receipts indicating quantity of material delivered to landfill.
- .8 Provide Departmental Representative with receipts indicating quantity and type of materials sent for recycling.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 Deconstruction: systematic dismantling of structure and site works in a manner that achieves safe removal/disposal of hazardous materials and maximum salvage/recycling of materials.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

1.3 QUALITY ASSURANCE

- .1 Health and safety requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 PROTECTION

- .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and parts of building to remain in place. Provide bracing and shoring required.
- .2 Keep noise, dust and inconvenience to occupants to minimum.
- .3 Protect building systems, services and equipment.
- .4 Provide temporary dust screens, covers, railings, supports and other protection as required.

3.2 DEMOLITION SALVAGE AND DISPOSAL

- .1 Remove parts of existing site works identified on drawings and required to permit new construction.
- .2 Trim edges of partially demolished site elements to tolerances as defined by Departmental Representative to suit future use.
- .3 Dispose of removed materials, to appropriate recycling facilities except where specified otherwise, in accordance with authority having jurisdiction.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Comply with requirements of this Section when performing following work:
 - .1 Permanent withdrawal from service, cleaning, removal, and disposal of:
- 9,100L AST BC-2245, DFO PAC SYS 052, EC#00000664
The above noted tank contains approximately 9000L of diesel fuel of which the bottom 50mm will be considered sludge. Transfer and filter the existing usable diesel fuel into the new AST. (Fuel volume to be confirmed by owner prior to tender closing.
 - .2 Ensure all sludge is safely removed and disposed of and the tank is cleaned and free of harmful vapours prior to transport and or destruction.
 - .3 Provide a record for the tank system's removal and permanent withdrawal from service that includes either:
 - .1 Proof of professional engineering supervision for the removal work, or
 - .2 Proof of the removal work being carried out by an approved person.
Note: In British Columbia, the removal work must be carried out under the supervision of a professional engineer or by a person with the Industry Training Authority's (ITA) Certificate of Qualification as a Petroleum Equipment Installer.
 - .4 Provide certificates of destruction for each tank with the required tank and system identification information. The certificates to be submitted with a brief report either stamped by the supervising professional engineer or signed by an ITA certified Petroleum Equipment Installer stating the removal and permanent withdrawal were completed as required in this Section.

1.2 SECTION INCLUDES

- .1 Requirements and procedures for fuel storage tank removal and disposal.

1.3 RELATED REQUIREMENTS

- .1 Section 01 35 29.06 – HEALTH AND SAFETY REQUIREMENTS

1.4 REFERENCES

- .1 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA)
Canada Gazette Part II, Vol 142, No 13 – “Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations” (June 12, 2008) annexed out of the Canadian Environmental Protection Act.
 - .2 Canada Labour Code
 - .1 Part II (September 2000) – Occupational Safety and Health Regulations
- .3 Transport Canada (TC)

- .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .4 National Fire Code of Canada (NFC) 2010
- .5 Canadian Council of Ministers of the Environment (CCME)
 - .1 PN 1326 “Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products”.

1.5 SUBMITTALS

- .1 Submit to DFO Representative a proposed Work Plan and schedule prior to commencing work.
- .2 DFO will submit the required notification of the tank removal to the Dominion Fire Commissioner’s Office.
- .3 Submit to the DFO Representative a summary report either stamped by a professional engineer or signed by an ITA certified Petroleum Equipment Installer detailing the permanent withdrawal from service, removal and disposal of each tank. The report will include the dates when each tank was permanently withdrawn and removed and the destruction certificates bearing each tank’s BC ID number and EC system number. The report must also include a statement saying, “*The removal and permanent withdrawal were done in accordance with Sections 44 and 45 of the Canada Gazette Part II, Vol 142, No 13 “Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations” (June 12, 2008) annexed out of the Canadian Environmental Protection Act*”.
- .4 Submit to DFO Representative any necessary permits for transportation and disposal of the used oil tanks and any associated waste materials. Any vapour level test readings should be included as well.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements:

Perform work in accordance with all Federal, Provincial/Territorial, and local requirements pertaining to fuel storage tank removals. Regulations will include but are not limited to the following:

 - .1 National Fire Code (2010),
 - .1 Section 4.3.15
 - .2 Canada Gazette Part II, Vol 142, No 13 – “Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations” (June 12, 2008)
 - .1 Section 44. Permanent Withdrawal from Service
 - .2 Section 45. Removal of Storage Tank Systems
- .2 Health and Safety:
 - .1 Perform construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements
 - .2 Site Safety and Health Plan/Statement:

The Site Safety and Health Plan/Statement shall demonstrate that the contractor is aware of, and shall perform all work in accordance in full compliance with the requirements of Occupational Health and Safety, Canada Labour Code Part 2, and

the Worker's Compensation Act. In addition, the following safety precautions shall be enforced:

- .1 Disconnect or remove source of ignition from vicinity of tank. Provide temporary protection for safe movement of personnel and vehicle traffic.
 - .2 Cut, braze or weld metal only in monitored areas established to be free of ignitable vapour concentrations.
 - .3 When necessary, ground and bond metal equipment, including tanks and transfer pipes, before operating equipment or transferring flammable materials.
 - .4 Use non-sparking tools and intrinsically safe electrical equipment.
 - .5 Smoking shall not be permitted in the worksite.
- .3 Safety Requirements: worker protection.
- .1 Protective equipment and clothing to be worn by workers while in the tank removal Work Area.
- .4 Work Plan:
- Prior to commencement of work, contractor shall prepare and present to the DFO Representative their proposed Work Plan. The Work Plan is not limited to but should as a minimum include the following:
- .1 Describe the methods, means, sequence, and schedule to be employed in the pumping, cleaning, de-vaporizing, testing, inspecting, cutting, and disposal for the fuel storage tanks and related piping, equipment and appurtenances.
 - .2 Include methods to be employed for any product storage; sludge and liquid removal; purging and inerting.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of all tanks and associated tank materials at appropriate recycling facilities.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .4 Disposal of waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of waste oil in sealed leak proof drums. Label containers with appropriate warning labels.

1.8 EXISTING CONDITIONS

- .1 Reports and information available pertaining to used oil tanks will be provided to the contractor upon request.

Part 2 Products

NOT USED.

Part 3 Execution

3.1 GENERAL REQUIREMENTS

- .1 Furnish labour, materials, necessary permits, and equipment to permanently withdraw from service and remove the fuel storage tanks; clean and vapour free the storage tanks and associated piping; and dispose of the fuel tanks, associated piping, and any remaining used oil/sludge tank contents.

3.2 PERMANENT WITHDRAWAL FROM SERVICE

- .1 System is to be permanently withdrawn from service by a person approved to do so. In British Columbia, the withdrawal must either be supervised by a professional engineer or carried out by a person with the ITA Certificate of Qualification as a Petroleum Equipment Installer.
- .2 The contractor must keep and provide to the DFO Representative a record that includes the date on which they withdrew the system or component from service and that establishes that the fuel storage tank was withdrawn by an approved person or that the withdrawal was supervised by a professional engineer.
- .3 The contractor must ensure that:
 - .1 All dirty fuel and sludge are removed and disposed of;
 - .2 The fuel storage tank is purged of vapours to less than 10% of the lower flammability limit and the presence of vapours is checked with a combustible gas meter, and
 - .3 The withdrawal is done in a way such that there will be no immediate or long-term harmful effect on the environment and it will not constitute a danger to human life or health.

3.3 REMOVAL OF STORAGE TANK SYSTEMS

- .1 System is to be removed by a person approved to do so. In British Columbia, the fuel storage tank removal must be either supervised by a professional engineer or carried out by a person with the ITA Certificate of Qualification as a Petroleum Equipment Installer.
- .2 The contractor must keep and provide to the DFO Representative a record that includes the date on which the storage tank system or any associated components were removed. The record must state that the removal was done by an approved person or that the removal was supervised by a professional engineer.
- .3 Contact the DFO Representative immediately if there is evidence of contamination within the construction site.

3.4 DRAINING

- .1 Drain and flush piping into tank

- .2 Pump out liquid from tanks using an explosion proof, air driven or hand pump.
- .3 Remove sludge from tank bottom
- .4 Dispose of product and sludge in accordance with Federal, Provincial/Territorial, and local regulations. Waste disposal carrier to be licensed by Provincial Environmental Agency having jurisdiction.

3.5 VAPOUR REMOVAL

- .1 The contractor shall provide for the Engineer's approval a written description of the procedure to be used for vapour removal.

3.6 TANK REMOVAL FROM SITE

- .1 Dispose of tank in accordance with Federal, Provincial/Territorial, and local regulations.
- .2 Tank shall be removed from premises as promptly as possible after vapour removal. If tank remains at site overnight or longer, recheck vapour levels prior to transport and remove vapour if required.
- .3 Tanks shall not be reused. Cut suitable openings in the tanks to render tank unusable.
- .4 Ensure the tank is secured for transport with adequate venting at the top of the tank. 30mm minimum diameter is required for safe venting, however, larger vents are recommended.

3.7 DISPOSAL REQUIREMENTS

- .1 Perform disposal of all fluids and materials in accordance with all Federal, Provincial/Territorial, and local regulations.
- .2 Provide the DFO Representative with certificates or report of destruction or disposal for each tank to be removed. Certificates must include the BC ID numbers, EC System numbers, date of removal and permanent withdrawal, and a record of either the professional engineer or certified Petroleum Equipment Installer who supervised the removal and permanent withdrawal for each tank.

3.8 RECYCLE EXISTING FUEL

- .1 Filter existing fuel and transfer to new tank.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 19 - Waste Management and Disposal
- .2 Section 03 20 00 - Concrete Reinforcing
- .4 Section 03 30 05 - Cast-in-Place Concrete – Short Form.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-O86-09, Engineering Design in Wood (Limit States Design).
 - .3 CSA O121-08, Douglas Fir Plywood.
 - .4 CAN/CSA-S269.3-M92, Concrete Formwork.
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI Exterior Plywood for Concrete Formwork.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86.1-01.
 - .2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.
- .2 Tubular column forms: round, spirally wound laminated fiber forms, internally treated with release material. Spiral pattern not to show in hardened concrete.
- .3 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

- .4 Form liner:
 - .1 Plywood: medium density overlay Douglas Fir to CSA.
- .5 Form release agent: non-toxic, biodegradable, low VOC.
- .6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm² /s at 40°C, flashpoint minimum 150°C, open cup.
- .7 Sealant: to Section 07 92 10 - Joint Sealing.

Part 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- .5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .6 Do not place shores and mud sills on frozen ground.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.
- .9 Align form joints and make watertight. Keep form joints to minimum.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .13 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete..

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 2 days for walls and sides of beams.
 - .2 2 days for footings and abutments.
- .2 Remove formwork when concrete has reached 50 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide all necessary reshoring of members where early removal of forms may be

required or where members may be subjected to additional loads during construction as required.

- .4 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 74 19 - Waste Management and Disposal
- .3 Section 03 10 00 - Concrete Forming and Accessories
- .4 Section 03 30 05 - Cast-in-Place Concrete – Short Form.

1.2 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 315R-80, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN3-A23.3-04, Design of Concrete Structures for Buildings.
 - .3 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement.
 - .4 CAN/CSA-G40.21-04, Structural Quality Steels.
 - .5 CSA W186-M1990, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-30.18.
- .4 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .5 Mechanical splices: subject to approval of Departmental Representative..

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, unless indicated otherwise.
- .2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending

details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.
- .2 Upon request inform Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel in accordance with CAN/CSA-A23.1.
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 74 19 - Waste Management and Disposal
- .2 Section 03 10 00 - Concrete Forming and Accessories
- .3 Section 03 20 00 - Concrete Reinforcing

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 CSA International
 - .1 CSA A23.1/A23.2-2009, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
- .4 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Provide testing results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.4 QUALITY ASSURANCE

- .1 Submit to Departmental Representative minimum 4 weeks prior to starting concrete work, mix designs.
- .2 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

- .1 Do not modify maximum time limit without receipt of prior written agreement from the Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
- .2 Deviations to be submitted for review by the Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Ensure emptied containers are sealed and stored safely.
- .3 Divert unused concrete materials from landfill to local facility as reviewed by Departmental Representative.
- .4 Provide appropriate area on job site where concrete trucks can be safely washed.
- .5 Divert admixtures and additive materials from landfill to approved official hazardous material collection site as reviewed by Departmental Representative.
- .6 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Cement: to CSA A3001, Type GU.
- .2 Supplementary cementing materials: with minimum 20% fly ash replacement GGBFS, by mass of total cementitious materials to CSA A3001.
- .3 Water: to CSA A23.1.
- .4 Reinforcing bars to CAN/CSA-G30.18, Grade 400.
- .5 Other concrete materials: to CSA-A23.1/A23.2.

2.2 MIXES

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, to requirements given on the drawings and the following:

TYPE 1 MIX

- .1 Cement: Type GU Portland cement.
- .2 Minimum compressive strength at 28 days: 25MPa.
- .3 Fly ash content: Minimum 30%.
- .4 Class of exposure: N
- .5 Nominal size of coarse aggregate: 20 mm.
- .6 Slump at time and point of discharge: 80 mm ± 20mm.
- .7 Air content: 4 - 7%.
- .8 Chemical admixtures: type WN water reducing agent to manufacturer's recommended dosage in accordance with CAN3-A266.4-M78.

- | | | |
|-----|-----------------------------|--------------------------------|
| .9 | Air-dry density: | Minimum 2300 kg/m ³ |
| .10 | Maximum water/cement ratio: | .55 |

TYPE 2 MIX

- | | | |
|-----|---|--------------------------------------|
| .1 | Cement: | Type GU Portland cement. |
| .2 | Minimum compressive strength at 28 days: | 32 MPa. |
| .3 | Supplementary cementitious materials: | Maximum 20% of cementitious content. |
| .4 | Class of exposure: | C-2 |
| .5 | Nominal size of coarse aggregate: | 20 mm. |
| .6 | Slump at time and point of discharge: | 80 mm ± 20mm. |
| .7 | Air content: | 5 - 8%. |
| .8 | Chemical admixtures: type WN water reducing agent to manufacturer's recommended dosage in accordance with CAN3-A266.4-M78 | |
| .9 | Air-dry density: | Minimum 2300 kg/m ³ |
| .10 | Maximum water/cement ratios: | .45 |

MIX LOCATIONS

- Type 1 - Typical unless noted otherwise.
Type 2 – Exterior concrete slabs on grade.

Part 3 Execution

3.1 PREPARATION

- .1 Provide Departmental Representative 48 hours notice before before placing concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Protect previous Work from staining.
- .5 Clean and remove stains prior to application for concrete finishes.

3.2 CONSTRUCTION

- .1 Perform cast-in-place concrete work to CSA A23.1/A23.2.

3.3 INSERTS

- .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.
 - .1 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative

3.4 FINISHES

- .1 Formed surfaces exposed to view: smooth as cast in accordance with CSA A23.1/A23.2.

- .2 Interior floor slabs requiring smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CSA-A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.
- .3 Equipment pads: provide smooth trowelled surface.
- .4 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to place surfaces and use aluminum floats.
 - .2 Provide round edges and joint spacings using standard tools.
 - .3 Trowel smooth to provide lightly brushed non-slip finish.

3.5 CONTROL JOINTS

- .1 Control joints in slabs on grade at locations indicated, in accordance with CSA-A23.1/A23.2 and install specified joint sealer.filler.

3.6 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and in accordance with CSA A23.1/A23.2.

3.7 SITE TOLERANCE

- .1 Concrete floor slab finishing tolerance in accordance with CSA A23.1/A23.2.

3.8 FIELD QUALITY CONTROL

- .1 Concrete Testing: to CSA/A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative.

3.9 CLEANING

- .1 Use trigger operated spray nozzles for water hoses.
- .2 Designate cleaning area for tools to limit water use and runoff.
- .3 Cleaning of concrete equipment to be done in accordance with Section 01 35 43 – Environmental Procedures.

END OF SECTION

Part 1 General

1.1 PIPING

.1 All work covered by this section shall be carried out in accordance with, but not limited to the following standards, which shall be deemed to be and form part of this specification.

.1 American National Standards Institute:

B31.3 – “Chemical Plant and Petroleum Refinery Piping”

B2.1 – “Pipe Threads”

B16.50 – “Steel Pipe Flanges and Flanged Fittings”

B16.90 – “Steel Butt-weld Fittings

B16.11 – Forged Steel Fittings Socket Welding and Threaded

B16.21 – “Non-Metallic Gaskets for Pipe Flanges”

B18.20 – “Square and Hex Nuts and Bolts”

B16.25 – “Butt Welding Ends”

.2 Pressure Vessel Act of the Province of British Columbia.

.3 American Society of Mechanical Engineers: ASME Boiler and Pressure Vessel Code.

.4 Applicable Municipal and Regional Codes

1.2 MATERIALS

.1 Steel Pipe – Class 150

Steel pipe, valves and fittings shall meet the following requirements:

.1 40mm and down - Steel, seamless, Schedule 80, API 5L, Gr.B threaded or socket ends.

.2 50mm - Steel, seamless, XS, API 5L Gr.B plain or B.W. ends.

.2 Stainless Steel Pipe - 304L, Schedule 40

.3 Petroleum Tubing/Fittings

.1 Tubing: Type 316 stainless steel, ASTM A-269, seamless, full annealed, max. RB80, 12mm O.D. x 1.3mm wall thickness.

.2 Tube Fittings: 316 SS compression type, Swagelok or approved equal.

.3 Shut-Off Valves: 316 SS compression type, Swagelok or equal.

.4 Fusible link valve – 12mm - Firomatic B-200-F or approved alternate

.5 Flexible Metal Hoses: 316SS tube with SS overbraid, 12mm nominal hose I.D., 300mm minimum length, Swagelok or equal.

.6 Double wall, underground, flexible fuel pipe - OPW Flexworks supply and access pipe or equal.

- .4 Fittings
 - .1 40mm and down – ANSI Class 3000 CWP, steel, A-105 forged, threaded or socket
 - .2 50mm – B.W., carbon steel, std. Wt., A-234 Gr.WPB

1.3 INSTALLATION - GENERAL

- .1 All work to meet local and Federal codes and regulations, installed and tested to the satisfaction of governing fire authority and Owner.
- .2 Fabrication of all piping shall be as per the most current edition of CSA B139, ANSI B31.3 and ASME Boiler and Pressure Vessel Codes as applicable.
- .3 Piping to be installed fitted and tested only by a petroleum pipe fitter of journeyman status.
- .4 All piping must be flushed and tested.
- .5 The use of close nipples is not permitted.
- .6 The use of street elbows or 45 degree elbows for swing joints is not permitted.
- .7 The Contractor shall follow the drawings in all matters concerning the location and placement of all pipe, valves, fittings and supports, and no changes are to be made from the drawings without written permission from the Engineer.
- .8 Pipe shall be adequately supported to prevent abnormal stress from being imposed on equipment. Inaccuracies in pipe fabrication causing stress to be imposed on the equipment will not be permitted. The Owner reserves the right, if he deems it desirable, to have flanged joints unbolted at the equipment flanges to determine if there is any misalignment. Unsatisfactory workmanship shall be corrected by re-adjustment of pipe supports, anchor points, or re-fabrication.
- .9 All pipe and fittings must be swabbed clean (i.e. wire with a rag) prior to their assembly.
- .10 After a pipe or fitting has been swabbed, plug the end with a rag or other device.
- .11 Pipes shall be accurately cut to length so as to permit normal thread engagement between male and female threads.
- .12 Threads shall be tapered and smooth, cut with the correct taper, lead, thread angle and diameter and shall conform to NPT (A.S.A.-B2-1-1945).
- .13 After completion of installation, all scale, dirt, welding electrodes, slag, rags and other foreign materials shall be removed from the lines.
- .14 Each joint shall be cleaned to remove dirt, loose mill scale or foreign substances before placing pipe in alignment for welding.
- .15 Pipe not yet in use or in material stock pile on site shall be plugged with a rag or similar device to prevent foreign material from entering the pipe.
- .16 All practical precautions shall be taken to prevent the introduction of foreign material into instruments, valves, meters, loaders, pumps and any other equipment.

1.4 ABOVEGROUND PIPE INSTALLATION

- .1 Pipelines located aboveground wherever possible, in parallel banks, plumb and true to provide a neat, orderly arrangement.
- .2 Pipeline runs located as shown on plot plan and piping plan. Spaced centre to centre.
 - .1 40 mm and smaller - 150 mm C.C.
 - .2 50 mm – 200 mm C.C.
- .3 Pipe Supports
 - .1 Pipe supports/hangers shall be provided to support lines from 20 mm to 75 mm diameter every 2400 mm minimum and 100 mm to 300 mm diameter every 6500 mm or as shown on drawings.
 - .2 If variations to .1 above are indicated on the drawings, the drawings shall govern.

1.5 INSPECTION AND TESTING

- .1 The Contractor's work shall be available for inspection at any time by the Owner. All work shall be in accordance with and inspected and tested to meet the requirements of the standards specified.
- .2 Contractor shall test valves for shut off and operation, and check packing for leakage.
- .3 Defects disclosed in the work shall be made good or the work replaced without additional cost to the Owner.
- .4 Pressure testing shall be carried out as follows:
 - .1 The following piping and equipment shall not be subjected to field pressure testing:
 - .1 Tanks
 - .2 Rotating machinery, such as pumps
 - .3 Strainers and filter elements
 - .4 Pressure relieving devices, such as pressure relief valves
 - .5 Any equipment which does not have a specific test pressure at least as great as the piping test pressure.
 - .6 Instruments such as pressure gauges and differential pressure gauges
 - .7 Meters, hoses, Carter adapters, and quick couplings
 - .8 Control valves
 - .9 Any other equipment designated by the Owner
 - .2 Two or more lines may be combined into one test system.
 - .3 While piping is under test, care shall be taken to ensure that excessive pressure does not occur due to an increase in ambient temperature.
 - .4 Where repairs are necessary, lines shall be retested satisfactorily prior to acceptance by the Engineer.
 - .5 All piping joints shall be left unpainted and unwrapped or sleeved until after completion of field pressure testing.

- .5 Test Procedures
 - .1 The Contractor's work shall be available for inspection at any time by the Owner. All work shall be in accordance with and inspected and tested to meet the requirements of the standards specified.
 - .2 Contractor shall test valves for shut-off and operation, and check packing for leakage.
 - .3 Defects disclosed in the work shall be made good or the work replaced without additional cost to the Owner.
- .6 The contractor shall provide a written method of pressure testing of piping systems to the engineer prior to testing.
- .7 Repairs to piping systems shall be made with new material. No caulking or screwed joints, cracks, or holes will be acceptable. Where it becomes necessary to replace pieces of pipe, such replacements shall be the same lengths as the defective pieces.
- .8 Tests shall be repeated after any work has been replaced, if in the judgment of the Engineer it is necessary.
- .9 Pipe joints shall remain exposed until the pressure test has been successfully completed.

1.6 PIPELINE PAINTING

- .1 All aboveground pipelines including all vent lines and pipe supports are to be painted to meet CPPI Colour-Symbol System.
- .2 Painting and coating shall be performed after inspection and testing of the pipe.
- .3 Diesel pipe in Holland Yellow. Gasoline pipe, Vent pipe and Supports in White.
- .4 Surface preparation: Sandblast to SSPC-SP6 Commercial Blast Cleaning or cleaned to SSPC-SP11 Power Tool Cleaning to Bare Metal.
- .5 Prime Coat: One coat (3 mils dry thickness) General Paint 16-Line.
- .6 Final Coat: One coat (3 mils dry thickness) General Paint 16-Line:
or approved equivalent.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 26 05 21 – Wire and Cables (0 – 1000V)
- .3 Section 26 05 28 – Grounding – Secondary
- .4 Section 26 05 29 – Hangers – Support for Electrical Systems
- .5 Section 26 05 31 – Splitters, Junction Boxes, Pull Boxes
- .6 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings
- .7 Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.
 - .2 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC).
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

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

1.4 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Any reference to Codes, Standards, and Regulations in these Specifications shall be taken as the latest or the most current in effect at time of tender.
- .3 Comply with all requirements of the NFPA 30A , British Columbia Building Code, Workers' Compensation Board requirements, and the CSA C22.1 Canadian Electrical Code - Part I, including all Provincial and other amendments, Electrical Bulletins, and any local by-laws or rules regulating the installation of electrical equipment and their seismic restraint. In no instance, however, shall the standards established by the Contract Documents be reduced by any of these Codes or Regulations.

- .4 All equipment and materials shall bear the approval of the Canadian Standards Association and where applicable, the Underwriters' Laboratories of Canada or alternate shall bear local approval from the Electrical Inspection Department having jurisdiction. Include in the Tender all costs associated with obtaining local approvals.
- .5 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .6 Language operating requirements: provide identification nameplates and labels for control items in English.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS in accordance with Section 01 35 43 – Environmental Procedures.
- .3 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated 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 Submit 2 copies of 600 x 600 mm minimum size drawings and product data to inspection authorities.
 - .6 If changes are required, notify Engineer of these changes before they are made.
- .4 Provide CSA certified equipment and material.
 - .1 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Permits and fees: in accordance with General Conditions of contract.
 - .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Engineer.
- .5 Manufacturer's Field Reports: submit to Engineer manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing.

1.6 QUALITY ASSURANCE

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

- .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Engineer with schedule within 2 weeks after award of Contract.

1.8 SYSTEM STARTUP

- .1 Instruct Engineer and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.9 OPERATING INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Refer to mechanical drawings for pump and hose reel motors.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into 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 lines | 6 mm high letters |

- .2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Engineer prior to manufacture.

- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

| | Prime | Auxiliary |
|-----------------------------|--------|-----------|
| up to 250 V | Yellow | |
| up to 600 V | Yellow | Green |
| up to 5 kV | Yellow | Blue |
| up to 15 kV | Yellow | Red |
| Telephone | Green | |
| Other Communication Systems | Green | Blue |
| Fire Alarm | Red | |
| Emergency Voice | Red | Blue |
| Other Security Systems | Red | Yellow |

2.8 FINISHES

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

2.9 FIRESTOPPING

- .1 Firestopping shall be performed by the Division 26 Contractor as required by the BC Building Code.

- .2 Rated sealing systems for penetrations of Fire Rated walls, ceilings and floors: Hilti, Nuco, PFP Partners, Flamesafe, or 3M. Contractors are to submit ULC, cUL, WHI, or equivalent certified Design or System Data Sheets to demonstrate compliance of a particular Floor or Wall Assembly, Through Penetrant, and Sealant with requirements and for what period of time.
- .3 Submit product data of the proposed firestopping system for review prior to installation.
- .4 The Engineer, at his discretion, shall disassemble up to 10% of the total firestopping assemblies for detailed inspection. The contractor shall make good the inspected firestopping assemblies at no cost to the project.
- .5 Should any of the inspected firestopping assemblies not comply with the manufacturer's assembly instructions or the BC Building Code requirements, all firestopping assemblies shall be removed and replaced by the Division 26 Contractor at no cost to the client.
- .6 All firestop penetrations shall be labelled. Labels shall be secured to surface directly beside firestop penetration. Firestop penetration labels shall include the following information:
 - .1 Name of installer
 - .2 Date of installation
 - .3 Type of sealing
 - .4 Time duration of sealnt

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.
- .3 Install equipment as indicated on Drawings.
- .4 Locations of all existing services, features and appurtenances shown on the drawings are to be considered approximate only. Verify all locations in the field prior to construction.

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.6 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 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.

3.7 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

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

- .1 CSA C22.2 No. 0.3 (latest edition) – Test Methods for Electrical Wires and Cables.
- .2 CSA C22.2 No. 65 – Wire Connectors.

1.3 PRODUCT DATA

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

PART 2 PRODUCTS

2.1 WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Jacketted.
- .3 All branch circuits shall be installed with separate, dedicated neutrals.
- .4 All wiring shall be rated at 75°C when connected to equipment rated 75°C.
- .5 All wiring shall be listed for the application for which it is installed.

2.2 TECK 90 HL CABLE

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
 - .1 Size as indicated on Drawings.
 - .2 Grounding conductor: copper
 - .3 Circuit conductors: copper, size as indicated.
 - .4 Rated for hazardous areas as indicated on Drawings.
- .3 Insulation: Chemically cross-linked thermosetting polyethylene, type RW90, rated 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum.

- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .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.
 - .2 Channel type supports for two or more cables at 2000 mm centers.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight, explosion-proof approved for TECK cable.

2.3 OUTDOOR FLEXIBLE CABLES

- .1 Approved for wet locations.
- .2 Insulation: 90° EPDM, type SOOW, rated 600V.

2.4 WIRE AND BOX CONNECTORS AND MISCELLANEOUS MATERIALS

- .1 Connectors for wire and cable splices and taps: minimum standard of acceptance: use 3M Co. 'Scotchlok', Thomas & Betts PT Series, Buchanan 'B', or IDI Electric 'Super Nut', for conductors #8 AWG or smaller; Burndy 'Servit' Type KSU for conductors #1/0 AWG and smaller; and Burndy 'OKlip' Type KVSU for conductors 750 MCM or smaller.
- .2 Clamps, glanding connectors, or box connectors for armoured cable, aluminum sheathed cable, mineral-insulated cable, flexible conduit, as required.
- .3 Lugs, terminals, screws used for termination of wiring shall be suitable for either copper or aluminum conductors.
- .4 Plastic electrical insulation tape: minimum standard of acceptance is Scotch #88.
- .5 Kellems grips: double-eye, double-weave, stainless steel.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 All wiring shall be in conduit unless otherwise indicated.

- .2 Install cable in trenches in accordance with Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts, the Canadian Electrical Code and the Drawings.
- .3 Terminate cables in accordance with the Canadian Electrical Code.
- .4 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .5 Conductor length for parallel feeders to be identical.
- .6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .7 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .8 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
 - .2 In underground ducts in accordance with Section 33 65 76 – Direct Buried Underground Cable Ducts.
 - .3 In surface and lighting fixture raceways in accordance with Section 26 05 29 – Hangers and Supports for Electrical Systems.
- .2 The number of splices in any circuit shall be kept to an absolute minimum consistent with available coil length and installation conditions.
- .3 Branch circuits shall be sized for a maximum 3% voltage drop.
- .4 Install cable in trenches in accordance with the Canadian Electrical Code and the Drawings.
- .5 Cable Color Coding: to Section 26 05 00 Common Work Results for Electrical.

3.4 INSTALLATION OF TECK90 HL CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable exposed, securely supported by straps.
- .3 Provide adequate protection and strain relief for cables between stub-up and devices.
- .4 All cables shall include grounding conductor.

3.5 INSTALLATION OF FLEXIBLE CABLES

- .1 Install flexible cables in existing raceways to dock.

3.6 INSTALLATION OF WIRE AND BOX CONNECTORS

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure-type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.
- .2 Wire and cable splices and taps shall be made with approved connectors used in accordance with the manufacturer's instructions.
- .3 After installation, wrap connectors having exposed conductive surfaces with plastic electrical tape, applying enough servings to provide uniform covering not thinner than the insulation of the largest conductor connected and overlapping the insulation of each connected conductor by not less than 12mm.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures.

1.2 REFERENCES

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated on drawings.

- .2 Rod electrodes: stainless steel 19 mm diameter by minimum 3 m long.
- .3 Plate electrodes: galvanized steel surface area 0.2 m², minimum 6 mm thick.
- .4 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .5 Insulated grounding conductors: green, copper conductors, size as indicated.
- .6 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .7 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Engineer.
 - .2 Inform Engineer of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Engineer.

3.2 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process, permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Minimum depth of burial for ground loop and grounding cables shall be minimum 450mm, maximum 600mm.

- .8 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .9 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .10 Bond single conductor, metallic armoured cables to cabinet at supply end.
- .11 Ground secondary service pedestals.

3.3 MAINTENANCE HOLES

- .1 Install conveniently located grounding stud, electrode, size as indicated stranded copper conductor in each manhole.
- .2 Install ground rod in each manhole so that top projects through bottom of manhole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

3.4 ELECTRODES

- .1 Install rod and plate electrodes and make grounding connections as indicated.
- .2 Bond separate, multiple electrodes together.
- .3 Use size 2/0 AWG copper conductors for connections to electrodes.
- .4 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.5 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.6 CLEANING

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

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

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 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 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 2 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 01 33 00 – Submittal Procedures.

1.2 REFERENCES

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 PRODUCTS

2.1 JUNCTION AND PULL BOXES

- .1 Construction: cooper free aluminum as required by the Canadian Electrical Code (explosion proof enclosure as required).
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18.2-06, Nonmetallic Outlet Boxes.
 - .2 CSA C22.2 No. 45.1-07, Rigid Metal Conduit – Steel.
 - .3 CSA C22.2 No. 56-04 (R2009), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2008), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-06(R2011), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05(R2010), Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 SUBMITTALS

- .1 Provide shop drawings in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

PART 2 PRODUCTS

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.
- .4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, 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 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.

2.3 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 2 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18 manufactured for use with conduit specified.
Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 FISH CORD

- .1 Polypropylene.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Surface mount conduits except where specified otherwise.
- .4 Use rigid galvanized steel threaded conduit outdoors except where specified otherwise.
- .5 Use epoxy coated conduit in corrosive areas.
- .6 Use electrical metallic tubing (EMT) indoors, except where specified otherwise.
- .7 Use explosion proof flexible connection for connection to explosion proof devices.

- .8 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .9 Minimum conduit size: 21 mm.
- .10 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .11 Mechanically bend steel conduit over 27 mm diameter.
- .12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .13 Install fish cord in empty conduits.
- .14 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .15 Dry conduits out before installing wire.
- .16 Remove burrs and sharp edges of conduits prior to installation.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Run conduits in flanged portion of structural steel.
- .3 Group conduits wherever possible on surface channels.
- .4 Do not pass conduits through structural members except as indicated.
- .5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS UNDERGROUND

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

3.6 CLEANING

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 61 00 - Common Product Requirements.
- .2 Section 31 23 01 - Excavating, Trenching and Backfilling.
- .3 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 CSA International
 - .1 CAN/CSA-Z809-08, Sustainable Forest Management.
- .2 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .3 Insulated Cable Engineers Association, Inc. (ICEA)
- .4 Sustainable Forestry Initiative (SFI)
 - .1 SFI-2010-2014 Standard.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for cables and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect cables from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

- .1 Not applicable.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Engineer.
 - .2 Inform Engineer of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Engineer.

3.2 DIRECT BURIAL OF CABLES

- .1 After sand bed in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable.
 - .1 Do not pull cable into trench.
- .2 Include offsets for thermal action and minor earth movements.
 - .1 Offset cables 150 mm minimum 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 minimum of surplus cable in each direction.
 - .1 Make splices and terminations in accordance with manufacturer's written recommendations 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 or in accordance with manufacturer's written recommendations; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .6 Cable separation:
 - .1 Maintain 50 mm minimum separation between cables of different circuits.
 - .2 Maintain 300 mm minimum horizontal separation between low and high voltage cables.
 - .3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.
 - .4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.
 - .5 Maintain 300 mm minimum lateral and vertical separation for control cables when crossing other cables with control cables in upper position.

3.3 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.

- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 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.
- .7 After installation of cables, seal duct ends with duct sealing compound.

3.4 INSTALLATION OF CABLE IN EXISTING CONDUITS

- .1 Install cables in existing conduits as indicated.
- .2 Test all existing communication cables in conduit prior to pulling new cables into conduit. Notify Owner of any non-operational cables, failed tests, deficiencies or excessive variations in the test results.
- .3 Test all existing communication cables in conduit after pulling new cables into conduit. Compare post-installation test results to the pre-installation test results and immediately notify Owner of any non-operational cables, failed tests, deficiencies or excessive variations.
- .4 Contractor shall replace all cables damaged during the installation of new cables in conduit.
- .5 Submit copy of completed test report forms to Owner immediately after tests are performed.

3.5 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.
 - .1 Include 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.
 - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 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 Engineer with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.6 CLEANING

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

3.7 PROTECTION

- .1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures.

1.2 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.29, Panelboards and Enclosed Panelboards.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
 - .2 Include on drawings:
 - .1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

PART 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.
- .2 120/208 V panelboards: bus and breakers rated for 10,000 A (symmetrical) interrupting capacity or as indicated.
- .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 Minimum of 2 flush locks for each panel board.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating of mains.
- .8 Mains: suitable for bolt on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 All breakers in all panelboards shall be of the same manufacturer.
- .11 Plug-in type circuit breakers shall not be used.
- .12 Trim and door finish: baked enamel as per colour schedule.
- .13 Isolated ground bus.
- .14 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

2.2 BREAKERS

- .1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .2 All breakers in all panelboards shall be of the same manufacturer. New breakers shall match those in existing panelboards.
- .3 Two- and three-pole circuit breakers shall have a common tripping mechanism and single handle. Handle ties are not acceptable.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for panelboards installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Engineer.
 - .2 Inform Engineer of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Engineer.

3.2 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Connect loads to circuits.
- .3 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 CLEANING

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

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures.

1.2 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.14, Industrial Control Equipment.
- .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 2, Controllers, Contactors and Overload Relays Rated 600 V.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for contactors and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for contactors for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

PART 2 PRODUCTS

2.1 CONTACTORS

- .1 Contactors: to CSA C22.2 No.14.
- .2 Half size contactors not accepted.
- .3 Electrically operated, electrically or mechanically held, controlled by pilot devices as indicated and rated for type of load controlled.
- .4 Contactor to have 120V operating coils unless otherwise noted.

- .5 Complete with normally open contacts as indicated.
- .6 Mount in NEMA 12 Enclosure unless otherwise indicated.

2.2 EQUIPMENT IDENTIFICATION

- .1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Size 4 nameplate indicating name of load controlled.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install contactors and connect power wires and auxiliary control devices.
- .2 Identify contactors with nameplates or labels indicating panel and circuit number.
- .3 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

3.2 CLEANING

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

3.3 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by contactor installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 26 05 00 – Common Work Results for Electrical
- .3 Section 01 78 00 – Closeout Submittals
- .4 Section 01 61 00 - Common Product Requirements

1.2 REFERENCES

- .1 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 1-2000(R2008), Industrial Control and Systems: General Requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for control devices and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
 - .2 Include schematic, wiring, interconnection diagrams.

1.4 QUALITY ASSURANCE

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

1.5 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for control devices for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect control devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 E-STOP BUTTONS

- .1 Standard, marine grade, outdoor rated and hazardous area rated mushroom type. 1-NO and 1-NC contacts rated at 120 V, AC, labels as indicated. Stop pushbuttons coloured red, labeled "emergency stop".
- .2 Provide marine, outdoor and hazardous area rated enclosures as required.

2.2 SWITCHES

- .1 Hazardous area rated, 2 position switches as indicated on drawings. Standard wing lever rated at 120V AC, labels as indicated.
- .2 Provide outdoor and hazardous area rated enclosures as required.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for control devices installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Engineer.
 - .2 Inform Engineer of unacceptable conditions immediately upon discovery. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Engineer.

3.2 INSTALLATION

- .1 Install switches and E-stop pushbuttons as indicated on the Drawings.
- .2 Comply with all manufacturer's installation instructions and requirements.
- .3 Provide wiring for control devices.

3.3 FIELD QUALITY CONTROL

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

- .2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
- .3 Upon completion of sectional test, undertake group testing.
- .4 Check out complete system for operational sequencing.

3.4 CLEANING

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 78 00 - Closeout Submittals
- .2 Section 01 33 00 - Submittal Procedures
- .3 Section 01 61 00 - Common Product Requirements
- .4 Section 26 05 00 - Common Work Results for Electrical

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for leak detection equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for leak detection equipment for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect leak detection equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 The Contractor shall supply canopy lighting with all necessary incidentals, as shown on the Drawings.
- .2 Luminaire:
 - .1 Luminaire: 275W LED

- .2 Mounting: Pole mount.
- .3 Manufacturer: Acuity Brand Lighting
- .4 Catalog Number: DSX2-LED-80C-1000-40K-TFTM-120-SPA-PER-DDBXD
- .3 Pole:
 - .1 Manufacturer: Foxfab Metal Works
 - .2 Catalog Number: FSSS425HD-1-GLV
 - .3 Pole to be complete with hand holes at top and bottom, set of 4 (quantity) anchor bolts as specified on drawings, set of 4 (quantity) nut covers, 1 (quantity) drill pattern, hot dipped galvanized finish and base plate to manufacturers standard specifications.
- .4 Photocell:
 - .1 Manufacturer: Acuity Brand Lighting
 - .2 Catalog Number: DLL127F-1.5-JU

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Contractor responsible for pole base as specified on drawings.
- .2 Install poles true and plumb in accordance with manufacturer's instructions.
- .3 Install luminaire on pole.
- .4 Install bird guards on luminaire.
- .5 Check luminaire orientation, level and tilt.
- .6 Connect luminaire to lighting circuit.
- .7 Comply with all manufacturer's installation instructions and requirements.
- .8 Contractor to confirm exact location of equipment on-site.

3.2 FIELD QUALITY CONTROL

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

3.3 CLEANING

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

END OF SECTION

Part 1 General

1.1 GENERAL INSTRUCTIONS

- .1 The General Instructions shall form part of this section.
- .2 All works and materials shall meet the requirements of the standards referenced herein, the General Instructions, and specific requirements outlined in the following sub-sections.

Part 2 Products

2.1 MAIN AST

- .1 Supplied by owner refer to Drawing M1.
- .2 Split compartment 9000 litre diesel and 4600 litre gasoline.
- .3 Double wall, vacuum monitored, ULC S601 aboveground storage tank.
- .4 Steel.
- .5 Seismic anchoring.
- .6 Clock style level gauge.
- .7 Extreme care shall be taken during offloading, moving, and positioning of the tank to ensure that no damage occurs. Where paint is scratched it shall be touched up to match the original coating with paint supplied by the Manufacturer.

Part 3 Execution

3.1 TANK MANUFACTURING AND INSTALLATION SPECIFICATIONS

- .1 1–13,600 L aboveground storage tank for Diesel and Gasoline shall be supplied by Owner.
- .2 This tank shall be picked up and delivered to the Bamfield Lifeboat Station by the contractor.
- .3 Tank to be off loaded and installed by the contractor.

3.2 CONDITION OF SERVICE

- .1 For diesel and gasoline fuel dispensing.
- .2 Environment is Southern Coastal BC weather conditions.
- .3 Seismically active area.

3.3 TANK INSTALLATION

- .1 The tank shall be visually inspected over the entire surface. Special attention should be given to locations of shipping cradles and attachment straps. If any damage is present the tank shall not be installed until inspected by the owner and repaired if necessary by the manufacturer's representative.
- .2 Inspect for the following defects before and after shipping:
 - .1 Visible damage to shell plate or nozzles; i.e. dents, appurtenance nozzles out of alignment, stress bends or deformation of shell plates and/or saddle supports and paint scrapes.
- .3 The contractor shall immediately report all other defects to the Owner. The report of damage to the Owner shall include photographs signed and dated by the contractor's on-site foreman.

END OF SECTION