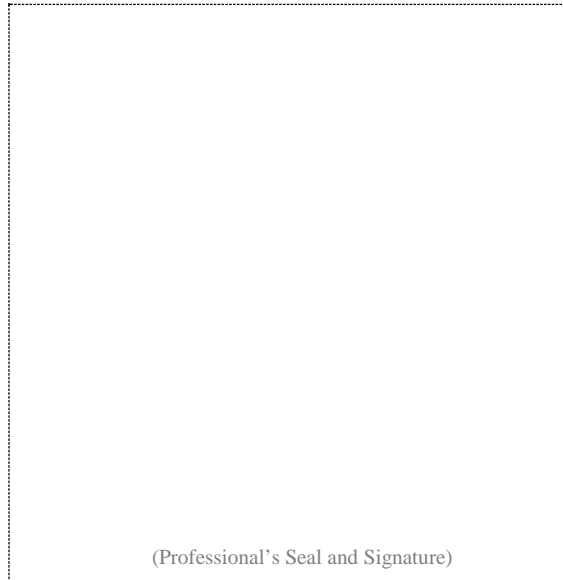


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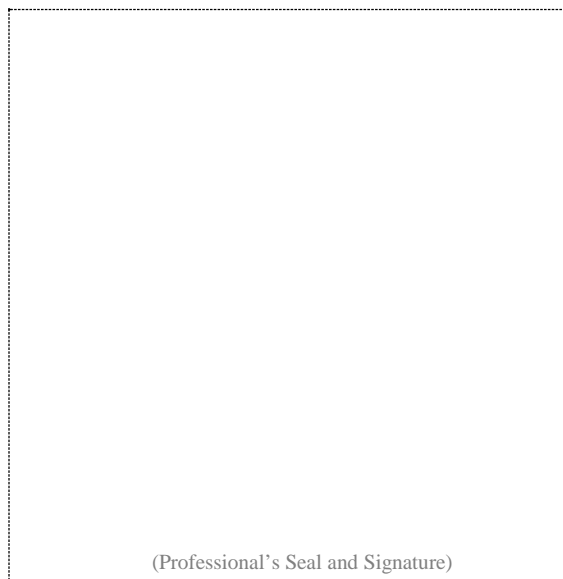
Mechanical
Stantec Consulting Ltd.



(Professional's Seal and Signature)

Date

Electrical
Stantec Consulting Ltd.



(Professional's Seal and Signature)

Date

END OF SEALS PAGE

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GENERAL

Cover Sheet & Drawing List G000

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END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this subcontract consists of minor electrical and mechanical upgrades associated with the new construction of the Timber and Concrete Floats at the DFO - Institute of Ocean Sciences (IoS) Facility in Sidney, BC. The project involves the demolition and replacement of the existing power pedestals, along with the float lighting masts to suit existing and future small vessel requirements.
- .2 The project is also to include the power connections to facilitate the requirements of any new fire suppression piping, heat tracing associated with the water system upgrades which service the new timber and concrete floats. The design of this work has been completed by others and has been included within the Invitation to Tender contract document package. The Contractor is expected to review these documents and provide the necessary power connections from the nearest existing supply panelboard sources.
- .3 The Contractor shall provide the conduit infrastructure and the all coordination effort required for the future telecommunication upgrades that are to be performed by the facilities preferred Contractor under a separate contract. The General Contractor and subcontractor shall work with the facility's preferred Contractor to ensure the infrastructure installation is suitable for their intended end use. The work must be free of defects so as not damage cabling and material being installed by others. Where infrastructure requirements are deemed unsuitable for use by the preferred Contractor, and/or by the Departmental Representative, immediate replacement, reinstallation or remediation of the work will be performed as required, to maintain schedule and without additional cost to the contract.
- .4 It shall be the responsibility of the Contractor to schedule all of the work with the Marine Contractor (Prime or Site General Contractor) and perform the work in conjunction with their master construction schedule. The Contractor is to provide all materials and labour described herein and within other discipline specification sections, subsections and drawings (general, civil, mechanical & electrical). The Work requires the use of specialists, agents and other consultants, whose services, qualifications and requirements are described herein and within other discipline specification sections and subsections (general, civil, mechanical & electrical).
- .5 Measurement for Payment:
 - .1 Payment for work will be made at the Prices per Unit as tendered for the various classifications of the work appearing in the "Unit Price Table" of the Form of Tender.
 - .2 Any work called for in the specifications or shown on the plans, or which is necessary for the completion of the work called for in the specifications and is not specifically listed as a separate item in the "Unit Price Table", shall be deemed incidental to the general purpose of the Contract and no separate payment will be made on account of any such work, but the cost of any such incidental work shall be included in the Price Per Unit values as tendered for the various items appearing in the "Unit Price Table".
 - .3 "Mobilization and Demobilization" a single lump sum will include all work required to supply the material, plant, and labour (including temporary power and

sanitary facilities) to the site of the work at the start of the project and to remove all materials, plant and labour from the site at the end of the project. The supply and maintenance of the temporary power and sanitary facilities for the work force will be included in this pay item. This item will also include all costs associated with the General Conditions requirements, and instructions of the Contract.

- .4 "Demolishing" a single lump sum will include all work required to supply the material, plant, and labour for removal and disposal of the existing timber floats electrical equipment, distribution, cabling and appurtenances other than those suitably deemed for reuse and where noted on the contract documents. The demolishing of all existing works as required to complete the project.
- .5 "Float A" new mechanical & electrical equipment, distribution, cabling and appurtenances, mounting hardware and fasteners will be supplied by the Contractor. Installations on Float A will be paid for as a lump sum inclusive of all labour and incidentals. Measurement for payment for float power and water pedestals, float or grade central distribution panelboards and the concrete pads for the central distribution panelboards where located on grade will be as a lump sum for each inclusive of all materials, labour and equipment.
- .6 "Float B1" new mechanical & electrical equipment, distribution, cabling and appurtenances, mounting hardware and fasteners will be supplied by the Contractor. Installations on Float B1 will be paid for as a lump sum inclusive of all labour and incidentals. Measurement for payment for float power and water pedestals, float or grade central distribution panelboards and the concrete pads for the central distribution panelboards where located on grade will be as a lump sum for each inclusive of all materials, labour and equipment.
- .7 "Float B2" new mechanical & electrical equipment, distribution, cabling and appurtenances, mounting hardware and fasteners will be supplied by the Contractor. Installations on Float B2 will be paid for as a lump sum inclusive of all labour and incidentals. Measurement for payment for float power and water pedestals, float or grade central distribution panelboards and the concrete pads for the central distribution panelboards where located on grade will be as a lump sum for each inclusive of all materials, labour and equipment.
- .8 "Float C" new mechanical & electrical equipment, distribution, cabling and appurtenances, mounting hardware and fasteners will be supplied by the Contractor. Installations on Float C will be paid for as a lump sum inclusive of all labour and incidentals. Measurement for payment for float power and water pedestals, float or grade central distribution panelboards and the concrete pads for the central distribution panelboards where located on grade will be as a lump sum for each inclusive of all materials, labour and equipment.
- .9 "Float D" new mechanical & electrical equipment, distribution, cabling and appurtenances, mounting hardware and fasteners will be supplied by the Contractor. Installations on Float D will be paid for as a lump sum inclusive of all labour and incidentals. Measurement for payment for float power and water pedestals, float or grade central distribution panelboards and the concrete pads for the central distribution panelboards where located on grade will be as a lump sum for each inclusive of all materials, labour and equipment.
- .10 Excavation, trenching, removals, imported backfill along with surface remediation's (whether asphalt and/or concrete) necessary for the installation of all

new services at grade level, in graded surface areas and within the paved parking area, as required for distribution power and communication pathways. Measurement for payment for excavation, trenching, removals, imported backfill and surface remediation's (whether asphalt and/or concrete) will be as a lump sum inclusive of all materials, labour and equipment. Contractor shall also provide a measured for payment by linear metre (lin.m) line item cost for additional excavation, trenching, removals, imported backfill and surface remediation (whether asphalt and/or concrete) beyond those required by the main contract as shown on the contract documents (at an assumed 900mm depth, completed installation), where alternate or extended pathways, or approved changes to the project scope, are requested by the Departmental Representative.

1.2 TIME OF COMPLETION OF THE WORK

- .1 Complete works as stipulated in the "Invitation To Tender" documentation. Total Completion no later than March 31, 2017.

1.3 CONTRACTOR AND SUBCONTRACTOR QUALIFICATIONS

- .1 The Contractor must submit the following:
 - .1 The Contractor shall submit for post-tender review by the Departmental Representative, their qualifications in regard to relevant past projects, similar in nature.
 - .2 The Contractor shall submit for post-tender review by the Departmental Representative, their subcontractor list and their subcontractor qualifications in regard to relevant past projects, similar in nature.

1.4 SPECIAL COORDINATION AND SCHEDULING

- .1 The Contractor's attention is specifically drawn to the following areas of the work with respect to coordination and scheduling:
 - .1 The Contractor is required to submit a detail Construction Schedule (in Gantt chart form), within ten (10) days of contract award, showing all requirements of the construction including any and all critical path items and lead times that may affect completion of the Work.
 - .2 Whenever a variation in the schedule, in excess of five (5) working days occurs or is expected to occur, update the Construction Schedule and notify the Departmental Representative.
 - .3 The Work will proceed with the construction of any given timber or concrete float at any given time. The Contractor must submit an initial work plan and schedule as a part of the tender submission. The drawings are diagrammatic to the requirements for this project. The Contractor is required to provide a more detailed coordination and construction schedule of the Work at the time of the project initiation meeting and further throughout the progress of the project, typically in two (2) week intervals. The Contractor shall provide detailed schedules for each phase and any possible overlap between the phases where the installations will affect the operations of the facility.
 - .4 The Contractor is responsible for the procurement of all equipment, devices and appurtenances required for the upgrade, the fabrication, the installation and all

testing. The existing facility operates from **8:00am to 6:00 pm, 5 days a week** and therefore any disruptions caused by the construction must be kept to a minimum. The Contractor is advised that prior to the commencement of Work in any specific area, all products, materials and supplies must be available for installation and testing within the scheduled work period. Work shall be scheduled, logged and agreed to by the Departmental Representative.

- .5 The Contractor is responsible to coordinate all Work defined within the contract documents with the Marine Contractor (Prime or Site General Contractor), prior to commencement of the Work and is expected to accommodate the other trade contractors and their respective work packages.
- .6 Unless otherwise instructed by IoS facility management, the Contractor shall notify the Marine Contractor (Prime or Site General Contractor), who in turn will notify the Canadian Coast Guard (CCG), attention 'Regional Operation Centre', **NO** less than five (5) days before the start and completion of proposed activities at the site, in order that they may issue 'Notices to Shipping'.

Contact information:

Website: <http://www.ccg-gcc.gc.ca/eng/CCG/Pacific>

CCG

Regional Operational Centre Alerting Desk

Telephone Number:

1-800-889-8852

Email:

notship.western@innav.gc.ca

- .7 The Contractor is responsible for commissioning of systems, commissioning with other trades, access and permissions.
- .8 Construction, Review and Acceptance by the Departmental Representative
 - .1 As the construction proceeds and as areas of the Work are completed, the Contractor shall provide a detailed review process acceptable to the Departmental Representative.

1.5 WORK AFFECTING THE EXISTING FACILITY

- .1 Work Sequence Requirements:
 - .1 The Contractor is advised that work is required in certain areas of the existing facility. For any and all work required on any portion of the existing facility or equipment, the Contractor must consult with the Departmental Representative prior to commencing with that portion of the work.
 - .2 A complete and detailed schedule of the work must be provided for approval by the Departmental Representative prior to commencing with that portion of the work.
 - .3 The Contractor must include all costs for the work affecting the existing facility. The Contractor must include in the overall project schedule the requirements for completing the work affecting the existing facility. This includes sequencing the

work to accommodate all operational requirements of the facility occupants, with which the Departmental Representative must be consulted.

- .2 Continued Occupancy
 - .1 The existing facility operates from **8:00 am to 6:00 pm, 5 days a week**. The existing operations and security of the facility must be maintained at all times.
 - .2 The Contractor must include in the contract all temporary measures (i.e. the provision of temporary power, where needed) required and with the approval of Departmental Representative to facilitate the requirements for the new construction/renovation work.
- .3 Alteration Project Procedures
 - .1 No services may be disrupted at any time that affects the operation of the existing facility or the occupants without a written approval from the Departmental Representative. All work shall be staged so interruption time must be as minimal as possible.
 - .2 If existing services are affected to accomplish installation of new work consult with Departmental Representative regarding procedures. This must be shown in the project initial schedule and the detailed schedule. All costs must be included, no exceptions or additional costs will be considered.

1.6 HEALTH AND SAFETY OF WORKERS AND FACILITY OCCUPANTS

- .1 Refer to Section 01 35 33 – Health and Safety.
- .2 The Contractor's Health and Safety Plan shall be implemented in conjunction with the Marine Contractor's (Prime or Site General Contractor) Health and Safety Plan. Policies and plans shall be reviewed by all contracting parties and comply with facility OHS policy. The most stringent guidelines of the policies are expected to be followed by the Contractor.
- .3 The Contractor is to provide contingencies in the Health and Safety Plan should the air quality in the Work area affect workers and facility occupants.
- .4 The Contractor is to provide detailed scheduling and planning for construction noise generating activities. In general, extended periods of noise generating activities that affect operations will not be acceptable.

1.7 CONTRACTOR USE OF PREMISES

- .1 Hours of Work:
 - .1 Work in the facility on weekdays: **7:00 am to 6:00 pm, 5 days a week**.
 - .2 Weekends or extended hours during the week:
 - .1 A notice to the Departmental Representative must be given.
 - .2 Approval must be obtained from the Departmental Representative
 - .3 The services of Commissionaires will be required.
- .2 Contractor shall limit use of premises for Work, for storage, and for access, to allow:
 - .1 Work by other Contractors.
 - .2 Contractor's laydown area will be designated by Departmental Representative. All material, tools, product etc. must be in stored in secure containers after hours.

- .3 Coordinate use of premises under direction of Departmental Representative.
- .4 Obtain and pay for use of additional storage or work areas, if needed for operations under this Contract.

1.8 RESPONSIBILITIES

- .1 Departmental Representative Responsibilities
 - .1 No additional responsibilities except as described in the specifications and the drawings.
- .2 Contractor Responsibilities
 - .1 Designate submittals and delivery date for each product in progress schedule.
 - .2 Review shop drawings, product data, samples, and other submittals. Submit to Departmental Representative notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - .3 Receive and unload products at site.
 - .4 Inspect deliveries jointly with Departmental Representative; record shortages, and damaged or defective items.
 - .5 Handle products at site, including uncrating and storage.
 - .6 Protect products from damage, and from exposure to elements.
 - .7 Assemble, install, connect, adjust, and finish products.
 - .8 Provide installation inspections required by public authorities.
 - .9 Repair or replace items damaged by Contractor or subcontractor on site under his control.
 - .10 Coordinate with the authorities and other trades onsite.

1.9 MINIMUM STANDARDS

- .1 Unless specified otherwise, perform work in accordance with the minimum standards set forth in the National Building Code of Canada, the Canadian Electrical Code, and the National Plumbing Code of Canada, current editions.

1.10 DRAWINGS AND SPECIFICATIONS

- .1 The Departmental Representative will provide the Contractor with two (2) printed copies of drawings and specifications. Electronic copies of the contract document will also be made available by the Departmental Representative.

1.11 GENERAL

- .1 The Contractor shall provide and apply its skill, judgement, expertise and experience as reasonably required to complete the Work and ensure that the Work is performed in a good, proper and workmanlike manner and not less than the accepted construction industry practice of a competent Contractor experienced in work similar to the Work to be performed.
- .2 The Contractor and each Subcontractor affirmatively represents that they are skilled and experienced in the performance of the Work as required by this Project and in the use and interpretation of drawings and specifications such as those included in the Contract

Documents; that they have carefully reviewed the drawings and specifications of this Project and that their Contract is based solely on these Documents, not relying in any way on any explanations or interpretations - verbal or written - from any other source. The Contractor agrees that it has exercised its aforementioned skill and experience and found the drawings and specifications sufficient and free from ambiguities, errors, or omissions for the purpose of determining its Contract for the performance of the Work in conformity with the drawings, specifications, and all other Contract Documents.

- .3 The Contractor shall report any error, inconsistency or omission in the Contract Documents it might discover, such review to be to the best of the Contractor's knowledge, information and belief.
- .4 The Contractor shall provide sufficient and adequate labour, materials and construction equipment necessary to properly correlate all phases of the Work to the end that the approved Construction Schedule can be maintained and the date of Substantial Performance of the Work be met. Each Contractor is responsible for all necessary development of the Work to fulfill the intent of the Contract Documents for a complete and/or functioning system whether totally defined by the drawings and specifications or not.
- .5 Each Contractor is responsible for all necessary development of the Work to fulfill the intent of the Contract Documents for a complete and/or functioning system whether totally defined by the drawings and specifications or not. In no case shall the Contractor or any of its subcontractors proceed with Work in uncertainty. The Contractor shall submit a Request for Information for items requiring direction or further clarification. Refer to the subsection herein.

1.12 PROJECT INFORMATION AND COMMUNICATION

- .1 Information and communication required to carry out the Work of the project issued by the Departmental Representative or the Contractors shall be in electronic form. This Information and communication may be but is not limited to the following:
 - .1 Project Drawings and Specifications.
 - .2 Contractor submittals.
 - .3 Requests for Information.
 - .4 Other forms of project communication.
- .2 The Departmental Representative requires that the Contractor set up an internet site organized to accommodate the required project information and communication.
- .3 The Contractor shall manage the site and ensure that the information is up to date. The Contractor shall notify the appropriate parties of information that is uploaded and updated onto the site.
- .4 The Departmental Representative, Contractor, other Contractors and subcontractors must have rights to access the site.

1.13 COORDINATION

- .1 Coordinate construction activities included in various sections of the specifications to assure efficient and orderly installation of each component. Coordinate construction operations included under different sections that depend on each other for proper installation, connection and operation.

- .2 Where the installation of one component depends installation of other components before or after its own installation, schedule activities in the sequence required to obtain the best results.
- .3 Coordinate installation of different components to assure maximum accessibility for maintenance, service and repair.
- .4 Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- .5 Coordinate space requirements and installation of the general, mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for ducts, and conduit, as closely as practicable; place runs parallel with line of building.
- .6 In finished areas except as otherwise indicated, conceal pipes, ducts and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- .7 Coordinate completion and clean-up of Work of separate sections in preparation for portions of the Work designated for the Departmental Representative's partial occupancy.
- .8 After Departmental Representative occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with the Contract Documents, to minimize disruption of Departmental Representative activities.

1.14 DOCUMENT CROSS-CHECK

- .1 The Contractor and their subcontractors shall review all current, project drawings from all of the contract work packages and their relevant specifications. Should specifications conflict with drawings, request clarification from the Departmental Representative before proceeding with the Work.
- .2 All subcontractors shall review and become familiar with the drawings for the required work.
- .3 Work affecting the existing structural members must be identified and approvals received prior to commencement of the work.
- .4 All costs resulting from work, including labour, materials, equipment, miscellaneous requirements related to work of other Subcontractors and/or required by coordination of other subcontractors, agents & vendors, is to be included. No additional costs will be considered.

1.15 REQUEST FOR INFORMATION

- .1 Maintain a Request for Information system for questions regarding clarifications. A Request for Information (RFI) will be a written document submitted in electronic form which includes, as a minimum, the following details: (Hand-written RFIs will not be accepted.)
 - .1 Date;
 - .2 References to drawings and/or specifications;
 - .3 Location of the work item in question;
 - .4 Complete description of the question;

- .5 Affect this item will have on other work or the construction schedule;
 - .6 Suggested solution to resolve the question(s) – MANDATORY;
 - .7 Date that response information is required.
- .2 An RFI form is to be prepared with headings and spaces for this information to be filled in.
 - .3 Allow five (5) working days for a response to a RFI.
 - .4 The Departmental Representative's response does not authorize changes in the Contract Price or Contract Time (Construction Schedule).
 - .5 RFIs are intended for clarification of drawings and specifications. RFI's shall not be used by the Contractor to identify potential errors or omissions in the Contract Documents, but are solely to communicate directly with the Departmental Representative for clarification on given matter.

1.16 DOCUMENTS

- .1 The Contractor is responsible for requesting any additional instructions or clarifications that may be required from the Departmental Representative which are needed for the performance of the Work and shall request such instructions or clarifications in time to avoid any delay in the Work.
- .2 Notwithstanding the foregoing, inconsistencies and omissions shall not include lack of reference on the drawings or in the specifications to labour or Products that are required or normally recognized within respective trade practices as being necessary for the complete execution of the Work.
- .3 Where "Notes" are included on the drawings, such work shall be included in the Contract Price. It is the Contractor's and Subcontractor's responsibility to review all "Notes" and include all related costs in the Work to perform the work identified in the "Notes." If the bidders require clarification of the scope of a "Note" such clarification shall be made prior to the tender closing, no additional costs will be considered by the Departmental Representative for bidder's failure to include all work associated with the "Notes."
- .4 Where typical is noted on the drawings, the requirements of the work apply to all conditions whether or not shown for each specific condition. The typical conditions apply to all subtrades work. It is the Contractor's and Subcontractor's responsibility to review the requirements and include all costs, no additional costs will be considered by the Departmental Representative for bidder's failure to include all work considered to be typical.
- .5 The Project consists of Products and assemblies that may require the work of more than one trade to complete. The Contractor, its Suppliers, manufacturers, architectural trades, mechanical trades, electrical trades and specialty trades are advised that all materials, products, cutting, fitting, patching, scheduling, coordination, and site conditions must be taken into account for the completion of the work and included in the Contract Price, no claims for additional costs will be considered by the Departmental Representative for failure to do so.

1.17 SPECIFICATION

- .1 The specifications and drawings are arranged in a manner to indicate the content of the Work. These sections do not however obligate the Departmental Representative to establish limits or limit the responsibility of any Subcontractor, Vendor or Supplier. The onus for defining the extent of the subcontractor's work remains with the Contractor to interpret all documents as a whole, and who will ensure that when awarding subcontracts, the area or scope of responsibility of any particular Subcontractor, Vendor or Supplier is set out in full detail and upon completion shall be considered as final and fully operational.
- .2 Division 1 of the specification specifies Work that is the direct responsibility of the General Contractor, administrative procedures and general requirements applying to all Subcontractors. Division 1 shall not be interpreted as defining limits of responsibility between the Contractor and its Subcontractors.
- .3 Ensure that Subcontractors understand that the General Conditions of the Contract and Division 1 apply to sections of the specification governing their Work.
- .4 Wherever in the Contract Documents the words "approval," "approved," "direction," "directed," "selection," "selected," "request," "requested," "report," "reviewed" and similar words are used, such approvals, directions, selections, requests and reports shall be given by the Departmental Representative unless specifically stated otherwise.
- .5 Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for the completion of that part of the Work.
- .6 Wherever in the Contract Documents the word "supply" is used in any form, it shall mean that the Work specified to be supplied includes delivery to site and unloading at location directed.
- .7 Wherever in the Contract Documents the word "install" issued in any form, it shall mean Work specified for installation includes receiving, uncrating, unpacking; moving from stored location to place of installation; and installing to meet specified requirements for a complete and fully operational system/equipment.
- .8 Wherever in the Contract Documents it is specified that Work is to proceed or to meet approval, direction, selection or request of jurisdictional authorities or others, such approval, direction, selection or request shall be in writing.
- .9 Wherever in the Contract Documents or as directed by the Departmental Representative it is specified that Work is to be repaired, made good or replaced, perform the work without any additional cost to the Contract.
- .10 Wherever in the specifications the term "Related Sections" is used, it shall be taken to mean Work that is directly related to the section but not specified therein. The purpose of this clause is to redirect the reader to other sections of the specification for Work related to this section. This clause shall not be construed as a definition of trade responsibility, nor is it exhaustive in its description of related Sections and is included for convenience only.
- .11 Except where a reference standard is specifically dated in the specifications, references to standards will be taken to mean the latest edition in effect at the date of award of this Contract. In the case of standards (dated or not) which appear in the specifications and

which are referenced in the National Building Code, the specific edition of the standard referenced in the code shall govern.

- .12 Where a standard is revised, supplemented or amended after award of the Contract, carry out the Work in accordance with latest edition of such standards. If the revision to the standard is such that a revision to the Contract Price is necessary, submit claims to the Departmental Representative in accordance provisions of the Contract Documents.

1.18 DRAWINGS

- .1 Refer to Section 01 78 00 – Close-out Submittals, for requirement to maintain a system of current drawings at all times.
- .2 Drawings are in part diagrammatic and are intended to convey the content of the Work required and, as such, indicate general and approximate location, arrangement and sizes of materials, elements, fixtures, equipment and outlets. Obtain more accurate information about locations, arrangement and sizes by studying, familiarizing with and correlating the Contract Documents, including coordination with the shop drawings, and becoming totally familiar with conditions and spaces affecting these matters before proceeding with the Work. Where job conditions require reasonable adjustments in the indicated locations and arrangements, make the necessary modifications at no additional cost to the Contract. Similarly, where existing conditions interfere with new installation and required location, include such relocation in the Work of this Contract. Install and arrange fixtures and equipment in such a way as to conserve as much headroom clearance and space as possible.
- .3 The Contractor is responsible for coordination of metric dimensions as shown on the drawings and as specified.

1.19 DOCUMENTS ON SITE

- .1 Maintain at the job site, one (1) copy of each of the following:
 - .1 Contract Drawings;
 - .2 Contract Specifications;
 - .3 Addenda;
 - .4 Reviewed Shop Drawings, product data and samples;
 - .5 Change Orders;
 - .6 Other modifications to the Contract;
 - .7 Field Test Reports;
 - .8 National Building Code, National Plumbing Code and the Canadian Electrical Code;
 - .9 Copy of all permits from Authorities Having Jurisdiction;
 - .10 Permit Drawings (where applicable);
 - .11 Industrial Health and Safety Regulations of WorkSafe BC;
 - .12 Contractor's Safety Program;
 - .13 Construction Schedule;
 - .14 Record Drawings (working marked print);
 - .15 Fire Safety Program;

- .16 Site Reports;
- .17 Site Instructions;
- .18 WHMIS Documentation.

END OF SECTION

Part 1 General

1.1 PURPOSE

- .1 To ensure that both the construction project and the facility operations may proceed without undue disruption or hindrance and that the security of the facility is maintained at all times.

1.2 DEFINITIONS

- .1 "Contraband" means:
 - .1 an intoxicant, including alcoholic beverages, drugs and narcotics;
 - .2 a weapon, or a component thereof;
 - .3 an explosive material or compound, or a component thereof, and;
 - .4 any item not described in paragraphs (.1) to (.3) that could jeopardize the security or the safety of workers or facility persons, when that item is possessed without prior authorization.
- .2 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
- .3 "DFO" means Department of Fisheries and Oceans (Canada).
- .4 "IOS" means Institute of Ocean Sciences.
- .5 "Construction employees" mean persons working for the General Contractor, the sub-Contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .6 "Departmental Representative" means the: Tendering Authority; Facility Authority; or the Technical Authority, Departmental Representative whom will provide final directions concerning the project.
- .7 "Perimeter" means the fenced & parking compound limits of the IoS facility site.
- .8 "Construction limits" means the area, as indicated in the contract documents, that the Contractor will be allowed to work. This area may or may not be isolated from the Hangar areas of the IoS facility site. Limits to be confirmed at the construction start-up meeting.

1.3 PRELIMINARY PROCEEDINGS

- .1 At construction start-up meeting:
 - .1 Discuss the nature and extent of all activities involved in the Project.
 - .2 Establish mutually acceptable security procedures in accordance with this instruction and the facility's particular requirements.
- .2 The Contractor's responsibilities:
 - .1 Ensure that all construction employees are aware of the security requirements;
 - .2 Co-operate with the facility's personnel in ensuring that security requirements are observed by all construction employees.

1.4 CONSTRUCTION EMPLOYEES

- .1 Entry to facility's property will be refused to any person there may be reason to believe may be a health or security risk.
- .2 Any person employed on the construction site will be subject to immediate dismissal from property if they:
 - .1 appear to be under the influence of alcohol, drugs or narcotics;
 - .2 behave in an unusual or disorderly manner;
 - .3 are in possession of 'contraband'.

1.5 VEHICLES

- .1 All unattended vehicles on property must have windows closed, doors and trunks locked and keys removed. The keys must be securely in the possession of the owner or an employee of the company that owns the vehicle in the event the vehicle is required to be moved.
- .2 The Departmental Representative may limit at any time the number and type of vehicles allowed on the premises.
- .3 Drivers of delivery vehicles for material required by the project will be allowed on the premises to coordinate the delivery with the Contractor. Upon delivery they will be required to move their vehicles.
- .4 Where Departmental Representative allows construction trailers to be left inside the construction area of the site perimeter, the trailer doors must be locked at all times. All windows must be securely locked when left unoccupied.

1.6 PARKING

- .1 The parking area(s) to be used by construction employees will be designated by the Departmental Representative. Parking in other locations will be prohibited and vehicles may be subject to removal.

1.7 SHIPMENTS

- .1 To avoid confusion with the facility's own shipments, address all shipments of project material, equipment and tools in the Contractors name and have a representative on site to receive any deliveries or shipments. The Contractor is responsible for the unloading of the delivery and providing any required lifting apparatus, equipment or specialized vehicles. DFO, IoS or Departmental Representatives personnel will **NOT** accept receipt of deliveries or shipments of any material, equipment or tools.

1.8 TELEPHONES

- .1 The installation of telephones, facsimile machines and computers with internet connections maybe permitted within the facility with the approval of the Departmental Representative.
- .2 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, telephones used as 2-way radios are permitted within the construction area.

- .3 The Departmental Representative may limit the use of 2-way radios, where a disruption to facility operation could occur.

1.9 WORK HOURS

- .1 Conform to Section 01 11 00 – Summary of Work.
- .2 A minimum of seventy-two (72) hours advance notice will be required to obtain permission for work on weekends. In case of emergencies or other special circumstances, this advance notice may be waived at the discretion of the Departmental Representative.

1.10 OVERTIME WORK

- .1 Conform to Section 01 11 00 – Summary of Work.
- .2 Provide seventy-two (72) hours advance notice to Departmental Representative for all work to be performed after normal working hours of the facility. Notify the Departmental Representative immediately if emergency work is required, such as to complete remediation's or make the construction site safe and secure.

1.11 ESCORT (COMMISSIONAIRE)

- .1 General
 - .1 The Contractor may require a qualified escort (Commissionaire) during certain times of the work. The Contractor is responsible for providing an estimate of the services (in hours) to be included in their tender submission.
 - .2 The Commissionaire service and all other associated costs for the Commissionaire are to be carried by the Contractor in the tender.
- .2 Allowance
 - .1 The Contractor shall allow the following rates for the commissionaire services:
 - .1 At the current hourly rates for Commissionaire services up to eight (8) hours per day.
 - .2 At the current hourly overtime rate for Commissionaire services in excess of eight (8) hours per day.
 - .3 The Contractor shall review the Contract Documents and submit within the tender, an allowance of what they regard as the required time needed for the Commissionaire services.
 - .4 Retain Commissionaire services and coordinate rates directly with the Commissionaires agent by contacting the service directly at: operationscentre@commissionaires.bc.ca
- .3 Schedule
 - .1 The Contractor shall provide to the Departmental Representative a minimum of 48 hour notice in advance of when the commissionaire services will be required.
- .4 Payment
 - .1 The cost for the commissionaire will be assessed towards the contract by change order.

1.12 TOOLS AND EQUIPMENT

- .1 Where requested maintain a complete list of all tools and equipment to be used during the construction project.
- .2 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.
- .3 Store all tools and equipment in approved locations.
- .4 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the Contractor. Secure and lock scaffolding when not erected and when erected secure in a manner agreed upon with the Departmental Representative.

1.13 SMOKING RESTRICTIONS

- .1 Smoking is not permitted inside the facility or outdoors within the perimeter of the facility.
- .2 Persons in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist may be directed to leave the site.
- .3 Smoking is permitted outside the perimeter of the facility in an area designated by the Departmental Representative.

1.14 CONTRABAND

- .1 Weapons, explosive materials, alcoholic beverages, drugs and narcotics are prohibited on the site.
- .2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Departmental Representative.
- .3 Contractors should be vigilant with both their employees and the employees of their subcontractors, vendors and suppliers that the discovery of contraband may result in immediate dismissal of the identified individual(s).

1.15 ACCESS TO AND REMOVAL OF FACILITY PROPERTY

- .1 Construction personnel and commercial vehicles will not be admitted to the facility after normal working hours, unless arranged and approved by the Departmental Representative.

1.16 STOPPAGE OF WORK

- .1 The Departmental Representative may request at any time that the Contractor, his employees, subcontractors and their employees stop work or leave the site immediately due to any situation occurring within the facility. The Contractor's site supervisor shall note the name of the facility personnel making the request and the time of the request and follow all given directions.
- .2 The Contractor shall advise the Departmental Representative within twenty-four (24) hours of this delay to the progress of the work.

END OF SECTION

Part 1 General

1.1 SCHEDULING PROJECT SCOPE

- .1 Refer to Section 01 11 00 – Summary of Work.
- .2 Review the Time of Completion of the Work and confirm to the Departmental Representative that the work will be completed within the time allotted.
- .3 The contractor must provide detailed schedules of the work as it affects the operations of the facility.

1.2 SYSTEM DESCRIPTION

- .1 Project Time Management: describes processes required to ensure timely completion of Project. These processes ensure that various elements of Project are properly coordinated. It consists of planning, time estimating, scheduling, progress monitoring and control.
- .2 Planning: this is most basic function of management, that of determining presentation of action and is essential.
 - .1 It involves focusing on an objective consideration of future, and integrating forward thinking with analysis; therefore, in planning, implicit assumptions are made about future so that action can be taken today.
 - .2 Planning and scheduling facilitates accomplishment of objectives and should be considered a continuous interactive process involving planning, review, scheduling, analysis, monitoring and reporting.
- .3 Ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made. This implies progressively more reliability of scheduling data. Detail Project schedule is used for analysis and progress monitoring.
- .4 Ensure project schedule efficiencies through monitoring.
 - .1 When activities begin on time and are performed according to estimated durations without interruptions, original Critical Path will remain accurate. Changes and delays will however, create an essential need for continual monitoring of Project activities.
 - .2 Monitor progress of Project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that have started but are not yet completed.
 - .3 Monitoring should be done sufficiently often so that causes of delays are immediately identified and removed if possible.
- .5 Project monitoring and reporting: as Project progresses, keep team aware of changes to schedule, and possible consequences. In addition to CPM networks, use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.
 - .1 Narrative reporting begins with statement on general status of Project followed by a summarization of delays, potential problems, corrective measures and Project status criticality.

1.3 SUBMITTALS

- .1 Prepare submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Include costs for execution, preparation and reproduction of schedule submittals in bid documents, failure to comply with each required submission, may result in progress payment being withheld.
- .3 Submit letter ensuring that schedule has been prepared in co-ordination with major subcontractors.
- .4 Submit Project planning, monitoring and control system data as required by Departmental Representative in following form:
 - .1 CD files in original scheduling software containing schedule information, clearly labelled with data date, specific update, and person responsible for update.
 - .2 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.
 - .3 Criticality report listing activities and milestones with up to five (5) days total float used as first sort for ready identification of critical paths through entire project. List early and late starts and finishes dates, together with durations, codes and float for critical activities.
 - .4 Provide listing for each trade, activities due to start, to be underway, and finished. Provide list activity identification number, description and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.
- .5 Submit monthly schedule updates and written reports.
- .6 Maintain a submittal log.

1.4 QUALITY ASSURANCE

- .1 Use experienced personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate, including commissioning.

1.5 PROJECT MEETING

- .1 Meet with Departmental Representative within five (5) working days of Award of Contract date, to establish scope of Work and approach to project construction operations.

1.6 DETAIL SCHEDULE

- .1 Provide detailed project schedule (CPM logic diagram) within five (5) working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
 - .1 Work that affects facility operations;
 - .2 Shop drawings;
 - .3 Procurement;
 - .4 Construction;

- .5 Installations;
 - .6 Site works;
 - .7 Testing;
 - .8 Commissioning and acceptance.
- .2 Clearly show sequence and interdependence of construction activities and indicate:
- .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
 - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including
 - .1 Time for submittals, re-submittals and review.
 - .2 Time for fabrication and delivery of manufactured products for Work.
 - .3 Interdependence of procurement and construction activities.
 - .3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from (3) to (15) working days each.
- .3 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow coordination and control of project activities. Show continuous flow from left to right.
- .4 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as an indication of increased risk.

1.7 REVIEW OF THE CPM SCHEDULE

- .1 Allow five (5) work days for review by Departmental Representative of proposed detailed schedule.
- .2 Upon receipt of reviewed schedule, make necessary revisions and resubmit to Departmental Representative for review within three (3) working days.
- .3 Promptly provide additional information to validate practicability of schedule as required by Departmental Representative.
- .4 Submittal of schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.8 COMPLIANCE WITH CPM SCHEDULE

- .1 Comply with reviewed schedule.
- .2 Proceed with significant changes and deviations from scheduled sequence of activities which cause delay, only after review by Departmental Representative.
- .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
 - .1 Corrective measures may include:
 - .1 An increase of personnel on site for effected activities or work package.

- .2 An increase in materials and equipment.
- .3 Additional work shifts.

1.9 PROGRESS MONITORING AND REPORTING

- .1 On an ongoing basis, schedule on job site must show "Progress to Date". Arrange participation on and off site of subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.
- .2 Maintain a daily log of progress of the work.
- .3 Perform schedule update monthly status dated on last working day of month. Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .6 Submit monthly schedule updates with the progress payment request.
- .7 Submit monthly written report based on schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
 - .1 Description of progress made.
 - .2 Pending items and status of: permits, shop drawings, samples, mock-ups, deliveries, Change Orders, possible time extensions.
 - .3 Status of Contract completion date and milestones.
 - .4 Current and anticipated problem areas, potential delays and corrective measures.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 78 00 – Closeout Submittals.
- .2 Section 01 91 41 – Demonstration and Training.

1.2 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit within ten (10) days of written request and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Substitutions must be submitted in accordance with the requirements specified in Section 01 61 00 – Product Requirements will not be reviewed until approval from the Departmental Representative is obtained.
- .4 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .5 Where items or information is not produced in SI Metric units converted values are acceptable.
- .6 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .7 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .8 Verify field measurements and affected adjacent Work are coordinated.
- .9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .11 Keep one reviewed copy of each submission on site.
- .12 Maintain a submittal log.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment,

indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

- .3 Allow five (5) days for Departmental Representative's review of each submission, unless noted otherwise.
- .4 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.
- .6 Accompany submissions with transmittal letter, in duplicate, 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.
- .7 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .8 After Departmental Representative's review, distribute copies.

- .9 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request. Electronic copy to be in PDF file format. For large files, provide on CD-R (two copies required) or USB removable drive.
- .10 Submit two (2) printed copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 Shop drawings will be reviewed by the Departmental Representative for general conformance with the design concept of the project and general compliance with information given in the Contract Documents. The Departmental Representative will signify the status of the review by stamping and dating the electronic copy accordingly, in one of the following manners:
 - .1 Reviewed
 - .2 Reviewed as Noted
 - .3 Revise and Resubmit
 - .4 Not Reviewed

The Departmental Representative will return the electronic copy to the Contractor for their use and for copying for record keeping purposes and for distribution to Subcontractors and to suppliers.
- .14 The Contractor shall distribute copies of the returned shop drawings by the Departmental Representative as **“Reviewed,” “Reviewed as Noted”** to the Site Office and to the offices of Subcontractors, Vendors and Suppliers.
- .15 Shop drawings stamped **“Revise and Resubmit”** or **“Not Reviewed”** will be returned and shall be corrected and resubmitted to the Departmental Representative following the requirements stated above.
- .16 Only shop drawings stamped **“Reviewed”** and **“Reviewed as Noted”** shall be used on the site and used for fabrication and installation of work. All other shop drawings shall be considered as being not reviewed and shall not be used on site or for fabrication and installation of work.
- .17 Conform to review comments and stamped instructions of each shop drawing reviewed.
- .18 Only drawings noted for revision and re-submission need be resubmitted. Include revisions required by previous reviews before re-submission of shop drawings.
- .19 No new details or information shall be added to shop drawings after they have been fully reviewed.
- .20 No work dependent on shop drawing information shall proceed until review is given and verification received from the Departmental Representative. Be responsible for work performed prior to receipt of reviewed shop drawings. No review comments shall be construed as authorization for Changes in the Work.

- .21 Each subcontractor or supplier shall fabricate work exactly as shown on shop drawings and if shop practice dictates revision, shall revise shop drawings and resubmit.
- .22 File one (1) copy of each finally revised and corrected shop drawing on site.
- .23 Consider this article the minimum requirement. Further instruction contained in any particular specification section governs for that section of the Work.
- .24 Shop drawings must be in Metric measurement.
- .25 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept. This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.
- .26 The Contractor will have a system in place to allow the Departmental Representative, Contractor and its Subcontractors to have electronic access to the project submittals, shop drawings, project communication and latest drawings on file through an internet site. The Contractor and its Subcontractors are required to access the system to obtain the latest drawings on which their shop drawings will be based. If shop drawings are submitted based on out dated drawings shop drawings will be returned without further action. The users of the electronic system, once entered into the system, will be informed electronically of updated drawings available to them on the system. Photo copies of the Departmental Representatives design drawings will not be accepted.
- .27 The Departmental Representative's CAD files shall not be used by the Contractor, its Subcontractors or Suppliers for use in preparing shop drawings.
- .28 A copy of final reviewed shop drawings in electronic format shall be included in operating and maintenance manuals specified under Section 01 78 00.

1.4 CERTIFICATIONS

- .1 When specified in individual specification sections, submit certification by manufacturer to the Departmental Representative to indicate material or product conforms to or exceeds specified requirements.
- .2 Certificates may be recent or previous test results on material or product, but must be acceptable to the Departmental Representative.

1.5 MANUFACTURER'S FIELD REPORTS

- .1 Submit reports for the Departmental Representative's benefit as contract administrator.
- .2 Submit reports in duplicate within five (5) days of observation, to the Departmental Representative for information.
- .3 Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.6 PROGRESS DIARY

- .1 Keep a permanent, written record on the site of the progress of the Work. Keep record open to the inspection of the Departmental Representative, and copies shall be furnished to the Departmental Representative upon request.
- .2 The diary shall record all pertinent data such as:
 - .1 Commencement, progress and completion of various portions of the Work.
 - .2 Dates of all site meetings.
 - .3 Dates of visits or inspections by government authorities, inspectors, utility companies and any other visitors to the site.
 - .4 Record of work force employed.
 - .5 Information required by Contractor or Subcontractor. Clarifications requested and answers received.
 - .6 Materials causing delay.
 - .7 Actions or events causing delay.
- .3 Record of all quality control inspections and fire safety inspections including corrective actions taken.

1.7 PHOTOGRAPHS

- .1 Provide a digital photographic record/history of the progress of the Work. The record shall include electronic files and hard copies of each photograph taken.
- .2 Take a minimum of twenty-five (25) digital photographs monthly showing the progress of the Work for each system showing progression of the work.
- .3 Upon completion of the Work submit a labelled compact disk(s) or USB flash drive containing the record of all photographs.

1.8 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit WorkSafe BC status.
- .2 Submit transcription of insurance immediately after award of Contract.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Special procedures required during the work due to the presence of contaminated soil beneath the site.

1.2 RELATED SECTIONS

- .1 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Section 31 23 11 – Excavation and Handling of Contaminated Material.

1.3 REFERENCES

- .1 Canadian General Standards Board (CGSB).
 - .1 CGSB 51-GP-51M-81, Polyethylene Sheet for Use in Building Construction.
- .2 Transportation and Dangerous Goods Act.
- .3 CCME (Canadian Council of Ministers of Environment) Canadian Soil Quality Guidelines.
 - .1 Canadian Soil Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, Industrial (**CCME IL**).
 - .2 Canadian Soil Quality Guidelines for PAH, Industrial, Environmental Health guidelines, Soil Contact (**CCME ILsc**).
 - .3 Canadian Soil Quality Guidelines for PAH, Industrial, Environmental Health guidelines, Protection of Freshwater Life (**CCME ILfl**).
 - .4 Canadian Soil Quality Guidelines for PAH, Industrial, Environmental Health guidelines, Interim Soil Quality Criteria (CCME 1991) (**CCME Ili**).
 - .5 Soil Quality Guidelines for the Protection of Human Health (**CCME SQGhh**).
- .4 BC Environmental Management Act and Contaminated Sites Regulation (CSR) most recent updates related to soil standards and waste soil disposal.
- .5 BC Ministry of Environmental Technical Guidance Document 1. Site Characterization and Confirming Testing.
- .6 Department of Fisheries and Oceans Land Development Guidelines.

1.4 REGULATORY REQUIREMENTS

- .1 Provide erosion and sediment control in accordance with the following documents:
 - .1 Federal Fisheries Act 1970 (and applicable updates).
 - .2 BC Ministry of Environment Lands and Parks Approved and Working Criteria for Water Quality – 1998 (and applicable updates).
 - .3 BC Water Act 1988 Section 9 Changes in and about a Stream (and applicable updates).
 - .4 Land Development Guidelines for the Protection of Aquatic Habitat, Fisheries and Oceans Canada, and BC Ministry of Environment, Lands and Parks, 1993 (and applicable updates).

- .2 BC Environmental Management Act and Contaminated Sites Regulation (CSR) soil standards and spoil disposal requirements.
- .3 Ensure that water which falls upon or drains across the work site is collected, treated, and released in accordance with the above referenced documents and regulations.
- .4 Comply with all current federal, provincial, municipal and local anti-pollution laws, ordinances, codes, and regulations when disposing of waste materials, water, soil, debris, and rubbish.

1.5 POTENTIALLY CONTAMINATED MATERIALS

- .1 The soils at Institute of Ocean Sciences may contain contaminants – hydrocarbons and metals. Contractor shall follow appropriate steps as described in this and other sections of the Specifications when performing excavation and removal of soils.
- .2 Do not commence Work involving contact with potentially contaminated materials until decontamination facilities are operational and approved by the Departmental Representative.

1.6 ENVIRONMENTAL PROTECTION

- .1 Submit Environmental Management Plan that outlines contractors' procedures to achieve environmental protection requirements including the management of soils, erosion and sediment control, waste management, storm water management, spill prevention and response, noise and dust control, archaeological, and conformance to applicable environmental regulations, standards and requirements.
- .2 Contractor shall adhere to the following mitigation/protection measures:
 - .1 Spill Response Plan must be submitted to the Departmental Representative prior to project start-up.
 - .2 Spill response materials must be on site at all times and must be sufficient to handle potential spills.
 - .3 All machinery equipment must be in good working order.
 - .4 Fuelling operations/hazardous materials storage must be done in a protected area away from the marine environment and the drainage system.
 - .5 No waste materials or wastewater is to be allowed to enter the drainage system or the marine environment. Construction runoff into the marine environment is a contravention of the Fisheries Act. This includes raw concrete and concrete silt. Drains in the vicinity of the project must be covered with filter media.
 - .6 Soils must be stockpiled so they are completely contained and stockpiled in an area designated by the Departmental Representative.

1.7 VEHICULAR ACCESS AND PARKING

- .1 Maintenance and Use
 - .1 Prevent contamination of access roads. Immediately scrape up debris or material on access roads which is suspected to be contaminated as determined by Departmental Representative; transport and dispose of in appropriate off-site

disposal facility. Clean access roads and any roads used by trucks or equipment at least once per shift using a street sweeper.

- .2 The Departmental Representative may collect soil samples for chemical analyses from the traveling surfaces of constructed and existing access routes prior to, during, and upon completion of Work. Excavate and dispose of clean soil contaminated by Contractor's activities at no additional cost to the Contract.

1.8 DUST AND PARTICULATE CONTROL

- .1 Execute work by methods to minimize raising dust from construction operations.
- .2 Implement and maintain dust and particulate control measures immediately during construction and in accordance with Province of British Columbia regulations.
- .3 Provide positive means to prevent airborne dust from dispersing into atmosphere. Use potable water for dust and particulate control.
- .4 Recover and treat any runoff from water applied to the roads or excavation. Prevent any water applied to the roads or excavation from discharging directly to the storm sewer or offsite.
- .5 Use chemical means for water misting system for dust and particulate control only with Departmental Representative's prior written approval.
- .6 As a minimum, use appropriate covers on trucks hauling fine or dusty material. Use watertight vehicles to haul wet materials.
- .7 Prevent dust from spreading to adjacent property sites.
- .8 Departmental Representative may stop work at any time when Contractor's control of dust and particulate is inadequate for wind conditions present at site, or when air quality monitoring indicates that release of fugitive dusts and particulate into atmosphere equals or exceeds specified levels in the Contractors Health and Safety Plan and by British Columbia Workers' Compensation Board. Cost of such work stoppage shall be borne by the Contractor.
- .9 If Contractor's dust and particulate control is not sufficient for controlling dust and particulate into atmosphere, stop work. Contractor must prepare and discuss procedures to resolve the problem. Make all necessary changes to operations prior to resuming any excavation, handling, processing, or any other work that may cause release of dusts or particulate.

1.9 POLLUTION CONTROL

- .1 Provide methods, means, and facilities to prevent contamination soil, water, and atmosphere from discharge of noxious toxic substances and pollutants produced by construction operations
- .2 Be prepared to intercept, clean up, and dispose of spills or releases that may occur whether on land or water. Maintain materials and equipment required for clean-up of spills or releases readily accessible on site.

- .3 Promptly report spills and releases potentially causing damage to the environment to:
 - .1 Authority having jurisdiction or interest in spill or release including any conservation authority, water supply authorities, drainage authority, road authority, and fire department.
 - .2 Owner of pollutant, if known.
 - .3 Person having control over pollutant, if known.
 - .4 Departmental Representative.
- .4 Contact manufacturer of pollutant if known and ascertain hazards involved, precautions required, and measure used in clean-up or mitigating action.
- .5 Take immediate action using available resources to contain and mitigate effects on environment and persons from spill or release.
- .6 Volatile Organic Compounds (VOC) Control:
 - .1 In addition to requirements of Section 01 35 33 – Health and Safety, monitor air quality for volatile organics at the Contractor’s work zone during contaminated materials excavation and management activities, and maintain a log of air quality readings. Report the readings to the Departmental Representative.
 - .2 If air quality monitoring indicates that release of volatile organic in air at site boundary exceeds Level C of Personal Protective Equipment threshold for air quality, implement corrective actions to control volatile organics.
 - .3 If actions are not sufficient to control release of volatile organics within an hour of identification of air quality problem, suspend work resulting in excessive volatile organic emissions. Contractor and Contractor’s Environmental Engineer to prepare and discuss additional methods that Contractor proposes to control the release of volatile organics with the Departmental Representative.
 - .4 Make all necessary changes at **NO** additional cost to the facility and Departmental Representative prior to resuming Work.
 - .5 In addition, if Departmental Representative’s monitoring of ambient air at site perimeter indicated that concentration of contaminants in air exceed WorkSafe BC specified limits, modify operations to keep volatile organic contaminants below acceptable limits.

1.10 WATER CONTROL

- .1 Maintain work areas relatively free of water such that the presence of water in the excavation does not interfere with the progress of the work.
- .2 Protect site from puddles or running water. Grade site to drain. Provide berm as necessary to protect the slopes of the excavation from soil erosion.
- .3 Prevent surface water runoff from leaving work areas.
- .4 Do not discharge decontaminated water, or surface water runoff, or groundwater which may have come in contact with potentially contaminated material, off the site or to municipal sewers.

- .5 Prevent precipitation from infiltrating or from directly running off stockpiled or exposed material surfaces. Cover stockpiled or exposed material surfaces at all times with an impermeable liner.
- .6 Direct surface waters outside of the excavation that has not contacted potentially contaminated materials to existing surface drainage systems.
- .7 Control surface drainage ensuring that gutters are kept open, water is not directed across or over pavements or sidewalks except through approved pipes or properly constructed troughs, and runoff from unstabilized areas is intercepted and diverted to suitable outlet.
- .8 Dispose of water in manner not injurious to public health or safety, to property, or to any part of Work completed or under construction.
- .9 Provide, operate, and maintain necessary equipment appropriately sized to keep excavations, staging pads, and other work areas free from water.
- .10 Contain water from stockpiled materials. Transfer all potentially contaminated surface waters to the designated waste water storage tanks.
- .11 Have on hand sufficient pumping equipment, machinery and tankage in good working condition for ordinary emergencies, including power outage, and competent workers for operation of pumping equipment.
- .12 Contain and collect surface and decontaminations water and transfer such collected water to the waste water storage tanks.

1.11 PROGRESS CLEANING

- .1 Maintain cleanliness of Work and surrounding site to comply with federal, provincial, and local fire and safety laws, ordinances, codes, and regulations.
- .2 Coordinate cleaning operations with disposal operations to prevent accumulation of dust, dirt, debris, rubbish, and waste materials.

1.12 FINAL DECONTAMINATION

- .1 Perform final decontamination of construction facilities, equipment, and materials which may have come in contact with potentially contaminated materials prior to removal from site.
- .2 Perform decontamination as specified to satisfaction of the Departmental Representative. The Departmental Representative will require the Contractor to perform additional decontamination if required.

1.13 REMOVAL AND DISPOSAL

- .1 Remove surplus materials and temporary facilities from site.
- .2 Dispose of all non-contaminated waste materials, litter, debris, and rubbish off site.
- .3 Do not burn or bury rubbish and waste materials on site.
- .4 Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, paint thinner, etc., in storm or sanitary drains.
- .5 Do not discharge wastes into streams or waterways.

- .6 Dispose of the following materials at appropriate off-site facility identified by Contractor and approved by Departmental Representative: debris including excess construction material, non-contaminated matter and rubbish; disposable PPE worn during final cleaning; wastewater removed from wastewater storage tanks, wastewater generated from final decontamination operations including wastewater storage tank cleaning; and lumber from decontamination pads.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Government of Canada:
 - .1 Canada Labour Code – Part II
 - .2 Canada Occupational Health and Safety Regulations.
- .2 National Building Code of Canada (NBC):
 - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 The Canadian Electric Code (as amended).
- .4 Canadian Standards Association (CSA) as amended:
 - .1 CSA Z797-2009 Code of Practice for Access Scaffold.
 - .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes.
 - .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures.
 - .4 CSA Z1006-10 Management of Work in Confined Spaces.
 - .5 CSA Z462- Workplace Electrical Safety Standard.
- .5 National Fire Code of Canada 2010 (as amended):
 - .1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.
- .6 American National Standards Institute (ANSI):
 - .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.
- .7 Province of British Columbia:
 - .1 Workers Compensation Act Part 3 Occupational Health and Safety.
 - .2 Occupational Health and Safety Regulation.

1.2 RELATED SECTIONS

- .1 Refer to the following current NMS sections as required:
 - .1 Section 01 14 10 – Security Requirements.
 - .2 Section 01 31 00 – Project Management and Coordination .
 - .3 Section 01 33 00 – Submittal Procedures.
 - .4 Section 01 51 00 – Temporary Utilities.
 - .5 Section 01 52 00 – Construction Facilities.
 - .6 Section 01 56 00 – Temporary Barriers and Enclosures.

1.3 WORKSAFE BC COVERAGE

- .1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

- .2 Maintain Worksafe BC coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.4 COMPLIANCE WITH REGULATIONS

- .1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC refuses to comply with a requirement of WorkSafe BC act or Occupational Health and Safety regulations.
- .2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by WorkSafe BC act or Occupational Health and Safety regulations.

1.5 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Work affected by the submittals shall not proceed until the review is complete.
- .3 Submit the following:
 - .1 Health and Safety Plan.
 - .2 Copies of reports or directions issued by federal and provincial health and safety inspectors.
 - .3 Copies of incident and accident reports.
 - .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
 - .5 Emergency procedures.
- .4 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within five working days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative for review upon request.
- .5 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.
- .6 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
 - .1 Be construed to imply approval by the Departmental Representative.
 - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
 - .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 RESPONSIBILITY

- .1 Assume responsibility as the Prime Contractor for work under this contract.

- .2 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.
- .3 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 HEALTH AND SAFETY COORDINATOR

- .1 The Health and Safety Coordinator must:
 - .1 Be responsible for completing all health and safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
 - .2 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.
 - .3 Be on site during execution of work.

1.8 GENERAL CONDITIONS

- .1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
 - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
 - .2 Secure site a night time or provide security guard as deemed necessary to protect site against entry.

1.9 REGULATORY REQUIREMENTS

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.10 WORK PERMITS

- .1 Obtain specialty trade permits related to project before start of work.

1.11 FILING OF NOTICE

- .1 The General Contractor is to complete and submit a Notice of Project as required by provincial authorities.
- .2 Provide copies of all notices to the Departmental Representative.

1.12 HEALTH AND SAFETY PLAN

- .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
- .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
 - .1 Primary requirements:
 - .1 Contractor's safety policy;
 - .2 Identification of applicable compliance obligations;
 - .3 Definition of responsibilities for project safety/organization chart for project;
 - .4 General safety rules for project;
 - .5 Job-specific safe work, procedures;
 - .6 Inspection policy and procedures;
 - .7 Incident reporting and investigation policy and procedures;
 - .8 Occupational Health and Safety Committee/Representative procedures;
 - .9 Occupational Health and Safety meetings;
 - .10 Occupational Health and Safety communications and recordkeeping procedures.
 - .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
 - .3 List hazardous materials to be brought on site as required by work.
 - .4 Indicate engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
 - .5 Identify personal protective equipment (PPE) to be used by workers.
 - .6 Identify personnel and alternates responsible for site safety and health.
 - .7 Identify personnel training requirements and training plan, including site orientation for new workers.
- .3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
- .4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.
- .5 Departmental Representative's review: the review of Health and Safety Plan by the either the Tendering Authority or the Facility Authority shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.13 EMERGENCY PROCEDURES

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
 - .1 Designated personnel from own company.

- .2 Regulatory agencies applicable to work and as per legislated regulations.
- .3 Local emergency resources.
- .4 Departmental Representative site staff.
- .2 Include the following provisions in the emergency procedures:
 - .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
 - .2 Evacuate all workers safely.
 - .3 Check and confirm the safe evacuation of all workers.
 - .4 Notify the fire department or other emergency responders.
 - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
 - .6 Notify Departmental Representative site staff.
 - .7 Follow the direction of the facility manager.
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
 - .1 Work at high angles.
 - .2 Work in confined spaces or where there is a risk of entrapment.
 - .3 Work with hazardous substances.
 - .4 Underground work.
 - .5 Work on, over, under and adjacent to water.
 - .6 Workplaces where there are persons who require physical assistance to be moved.
- .4 Design and mark emergency exit routes to provide quick and unimpeded exit.
- .5 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

1.14 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
- .2 Where use of hazardous and toxic products cannot be avoided:
 - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00 – Submittal Procedures.
 - .2 In conjunction with Departmental Representative, schedule to carry out work during “off hours” when tenants have left the building.
 - .3 Provide adequate means of ventilation in accordance with Section 01 51 00 – Temporary Utilities.

1.15 PRELIMINARY HAZARDOUS ASSESSMENT FORM

- .1 A PWGSC Preliminary Hazardous Assessment Form is included in **Appendix C** of this specification.

1.16 ELECTRICAL SAFETY REQUIREMENTS

- .1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.
 - .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative, provide minimum 2 weeks' notice prior to any shutdown.
 - .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

1.17 ELECTRICAL LOCKOUT

- .1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.
- .2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request authorization form. Have procedures available for review upon request by the Departmental Representative.
- .3 Keep the documents and lockout tags at the site and list in a logbook for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.18 OVERLOADING

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

1.19 FALSEWORK

- .1 Design and construct falsework in accordance with CSA S269.1-1975 (R2003) Falsework for Construction Purposes.

1.20 SCAFFOLDING

- .1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 Code of Practice for Access Scaffold and B.C. Occupational Health and Safety Regulations.

1.21 CONFINED SPACES

- .1 Carry out work in confined spaces in accordance with facility policy, contact the Departmental Representative for site specific information.
- .2 Carry out work in confined spaces in accordance with provincial regulations.

1.22 POWDER-ACTUATED DEVICES

- .1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.

1.23 FIRE SAFETY AND HOT WORK

- .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
- .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

1.24 FIRE SAFETY REQUIREMENTS

- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.25 FIRE PROTECTION AND ALARM SYSTEM

- .1 Fire protection and alarm systems shall not be:
 - .1 Obstructed.
 - .2 Shut-off.
 - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.
- .3 Be responsible/ liable for costs incurred from the fire department, the facility and the occupants, resulting from false alarms. Pay all incurred amounts without adding cost to the contract.

1.26 UNFORESEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

1.27 SITE AND FACILITY EMERGENCY EGRESS

- .1 Existing site and or facility exits or paths of egress to exits shall not be impeded by the Contractors work during the course of construction.

1.28 CONTRACTOR SITE PLAN DRAWING

- .1 Submit a contractor site plan drawing for review by the Department Representative, showing project layout, locations of the first-aid station, evacuation route and marshalling station, contractor fencing, contractor hoarding, site office(s), contractor toilet facilities, emergency transportation provisions, as well as the site and facility exiting.

1.29 POSTED DOCUMENTS

- .1 Post legible versions of the following documents on site:
 - .1 Health and Safety Plan.

- .2 Sequence of Work.
 - .3 Emergency Procedures.
 - .4 Contractor site plan drawing(s)
 - .5 Notice of Project.
 - .6 Floor Plans
 - .7 Notice as to where a copy of the WorkSafe BC Act and Regulations are available on the work site for review by employees and workers.
 - .8 Workplace Hazardous Materials Information System (WHMIS) documents.
 - .9 Material Safety Data Sheets (MSDS).
 - .10 List of names of Joint Health and Safety Committee members, or Health and Safety representatives.
- .2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
 - .3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.30 MEETINGS

- .1 Attendance is imperative at health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.

1.31 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 The Departmental Representative may issue a “stop work order” if non-compliance of Health and Safety regulations is not corrected immediately or within a posted time period. The General Contractor, Contractor and subcontractors will be responsible for any costs arising from such a “Stop Work” order.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 35 00 – Submittal Procedures.
- .2 Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

1.2 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.3 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4 Environmental protection plan: include:
 - .1 Name(s) of person(s) responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from site.
 - .3 Name(s) and qualifications of person(s) responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
 - .6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

- .7 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
- .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
- .9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- .12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .13 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

1.4 FIRES

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

1.5 DISPOSAL OF WASTES

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

1.6 DRAINAGE

- .1 Provide erosion and sediment control plan that identifies type and location of erosion and sediment controls to be provided. Plan: include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .2 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

- .3 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.7 SITE CLEARING AND PLANT PROTECTION

- .1 Restrict tree removal to areas indicated or designated by Departmental Representative.
- .2 Protect trees and plants on site and adjacent properties where applicable.

1.8 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material without Departmental Representative's approval.
- .3 Do not dump excavated fill, waste material or debris in waterways or ocean areas.
- .4 Design and construct temporary crossings to minimize erosion to waterways as necessary.
- .5 Do not skid logs or construction materials across waterways.

1.9 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to authority having jurisdiction emission requirements.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.10 RELICS AND ANTIQUITIES / ARCHAEOLOGICAL CONTROL

- .1 Relics and antiquities and items of historical or scientific interest that are found during construction shall remain property of the Department. Protect such articles and request directives from Departmental Representative.
- .2 Provide immediate notice to Departmental Representative if evidence of archaeological finds are encountered during excavation/ construction, and await Departmental Representative's written instructions before proceeding with work in the area of discovery.
- .3 Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .4 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

- .5 For all excavation work, retain services of an Archaeologist to be present at all times during excavation activities and adhere to the 'Chance Find' protocols.
- .6 Provide proof of all the mandatory criteria for the Archaeologist outlined below:
 - .1 Proof that the Archaeologist conducting this work has at one time, held a BC Heritage Conservation permit from BC Archaeology branch in his or her own name.
 - .2 Proof that the Archaeologist conducting this work has completed a Bachelor of Arts degree in Archaeology, or Anthropology, with a specialty in Archaeology.
 - .3 Examples of work conducted in BC in the last five (5) years.
 - .4 Obtain and pay for any permits, if required by the authority having jurisdiction and recommended by Registered Professional Consulting Archaeologist (RPCA). Send copy of approvals, permits and reports to the Departmental Representative.
 - .5 Allow for site monitoring during the excavations and trenching with a First Nations Observer. Retain the services of a representative of the area First Nations, as required. Monitoring to be conducted in parallel with the archaeological monitoring

1.11 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBCC), the Canadian Electrical Code (CEC), and the National Plumbing Code of Canada, current editions, including all amendments and other codes of provincial or local application provided, up to tender closing date. In the event of conflict or discrepancy, the more stringent requirements will apply.
- .2 Meet or exceed requirements of:
 - .1 Contract Documents;
 - .2 Specified standards, codes, and referenced documents.

1.2 SECURITY REQUIREMENTS

- .1 Comply with the requirements in Section 01 14 10 – Security Requirements.
- .2 Comply with any additional operational requirements established by Departmental Representative.

1.3 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions.
- .2 Smoking is permitted on the site outside the perimeter fence in a designated area defined by Departmental Representative.

END OF SECTION

Part 1 General

1.1 ASSOCIATIONS

- .1 AA - Aluminum Association, 900 19th Street N.W., Washington, D.C., U.S.A. 20006 URL <http://www.aluminum.org>
- .2 AASHTO - American Association of State Highway and Transportation Officials, 444 N Capitol Street N.W., Suite 249, Washington, D.C., U.S.A. 20001 URL <http://www.aashto.org>
- .3 ACEC Association of Consulting Engineers of Canada, 130 Albert Street, Suite 616, Ottawa, ON. K1P 5G4 URL <http://www.acec.ca>
- .4 AHA - American Hardboard Association, 1210W Northwest Hwy., Palatine, Illinois, U.S.A. 60067 URL : <http://www.hardboard.org>
- .5 AITC - American Institute of Timber Construction, 7012 S. Revere Parkway, Suite 140, Englewood, Colorado, U.S.A. 80112 URL <http://www.aitc-glulam.org>
- .6 AMCA - Air Movement and Control Association Inc., 30 West University Drive, Arlington Heights, Illinois, U.S.A. 60004-1893 URL <http://www.amca.org>
- .7 ANSI - American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, New York, U.S.A. 10036 URL <http://www.ansi.org>
- .8 APA - The Engineered Wood Association, P.O. Box 11700, Tacoma, Washington, U.S.A. 98411-0700 URL <http://www.apawood.org>
- .9 API - American Petroleum Institute, 1220 L St. Northwest, Washington, D.C., U.S.A. 20005-4070 URL <http://www.api.org>
- .10 ARI - Air Conditioning and Refrigeration Institute, 4100 N Fairfax Drive, Suite 200, Arlington, Virginia, U.S.A. 22203 URL <http://www.ari.org>
- .11 ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, Georgia, U.S.A. 30329 URL <http://www.ashrae.org>
- .12 ASME - American Society of Mechanical Engineers, ASME Headquarters, 3 Park Avenue, New York, New York, U.S.A. 10016-5990 URL <http://www.asme.org>
- .13 ISAP - International Society for Asphalt Paving, 400 Selby Avenue, Suite 1, St. Paul, MN 55102 U.S.A. URL <http://www.asphalt.org>
- .14 ASTM - American Society for Testing and Materials, 100 Barr Harbor Drive West, Conshohocken, Pennsylvania 19428-2959 URL <http://www.astm.org>.
- .15 AWCI - Association of the Wall and Ceiling Industries International, 803 West Broad Street, Suite 600, Falls Church, VA, U.S.A. 22046 URL <http://www.awci.org>
- .16 AWMAC - Architectural Woodwork Manufacturers Association of Canada, 516-4 Street West, High River, Alberta T1V 1B6 URL <http://www.awmac.com>. Alexandria, VA U.S.A. 22314-1757 URL <http://www.awpa.org>
- .17 AWPAA - American Wood Preservers' Association, P.O. Box 5690, Granbury Texas, U.S.A. 76049-0690 URL <http://www.awpa.com>

- .18 AWS - American Welding Society, 550 N.W. LeJeune Road, Miami, Florida U.S.A. 33126
URL <http://www.amweld.org>
- .19 AWWA - American Water Works Association, 6666 W. Quincy Avenue, Denver, Colorado,
U.S.A. 80235 URL <http://www.awwa.org>
- .20 CCA Canadian Construction Association, 75 Albert St., Suite 400 Ottawa, Ontario, K1P 5E7
URL <http://www.cca-acc.com>
- .21 CCDC Canadian Construction Documents Committee, Refer to ACEC, CCA, CSC or RAIC
- .22 CGA - Canadian Gas Association, 20 Eglinton Avenue West, Suite 1305, Toronto, Ontario
M4R 1K8 URL <http://www.cga.ca>
- .23 CGSB - Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier
Street, Hull, Quebec K1A 0S5 URL <http://w3.pwgsc.gc.ca/cgsb>
- .24 CISC - Canadian Institute of Steel Construction, 201 Consumers Road, Suite 300,
Willowdale, Ontario M2J 4G8 URL <http://www.cisc-icca.ca>
- .25 CLA - Canadian Lumbermen's Association, 27 Goulburn Avenue, Ottawa, Ontario, K1N
8C7 URL <http://www.cla-ca.ca>
- .26 CNLA - Canadian Nursery Landscape Association, RR #4, Stn. Main, 7856 Fifth Street,
Milton, Ontario, L9T 2X8 URL <http://www.canadanursery.com>
- .27 CRCA - Canadian Roofing Contractors Association, 155 Queen Street, Suite 1300, Ottawa,
Ontario K1P 6L1 URL <http://www.roofingcanada.com>
- .28 CSA - Canadian Standards Association International, 178 Rexdale Blvd., Toronto, Ontario
M9W 1R3 URL <http://www.csa-international.org>
- .29 CSC - Construction Specifications Canada, 120 Carlton Street, Suite 312, Toronto, Ontario
M5A 4K2 URL <http://www.csc-dcc.ca>
- .30 CSDMA - Canadian Steel Door Manufacturers Association, One Yonge Street, Suite 1801,
Toronto, Ontario M5E 1W7
- .31 CSPI - Corrugated Steel Pipe Institute, 652 Bishop Street N, Unit 2A, Cambridge, Ontario
N3H 4V6 URL <http://www.cspi.ca>
- .32 CSSBI - Canadian Sheet Steel Building Institute, 652 Bishop St. N., Unit 2A, Cambridge,
Ontario N3H 4V6 URL <http://www.cssbi.ca>
- .33 CUFCA Canadian Urethane Foam Contractor's Association, Box 3214, Winnipeg, Manitoba,
R3C 4E7 URL <http://www.cufca.ca>
- .34 CWC - Canadian Wood Council, 1400 Blair Place, Suite 210, Ottawa, Ontario K1J 9B8 URL
<http://www.cwc.ca>
- .35 EC - Environment Canada, Conservation and Protection, Inquiry Centre, 351 St. Joseph Blvd,
Hull, Québec KIA 0H3 URL <http://www.ec.gc.ca>
- .36 EFC - Electro Federation of Canada, 5800 Explorer Drive, Suite 200, Mississauga, Ontario
L4W 5K9 URL <http://www.electrofed.com>
- .37 EIMA EIFS Industry Manufacturer's Association, 3000 Corporate Center Drive, Suite 270,
Morrow, Georgia U.S.A. 30260 URL <http://www.eima.com>

- .38 FCC - Fire Commissioner of Canada, Place du Portage, Phase II, 165 rue Hotel de Ville, Hull, Quebec K1A 0J2 URL <http://info.load-otea.hrhc-drhc.gc.ca/fire-prevention/standards/commissioner.shtml>
- .39 Federal Halocarbon regulation 2003
- .40 HRSDC Fire Protection - Fire Commissioner of Canada, Place du Portage, Phase II, 165 rue Hotel de Ville, Hull, Quebec K1A 0J2 URL <http://info.load-otea.hrhc-drhc.gc.ca/fire-prevention/standards/commissioner.shtml>
- .41 IEEE - Institute of Electrical and Electronics Engineers, IEE Corporate Office, 3 Park Avenue, 17th Floor, New York, New York U.S.A. 10016-5997 URL <http://www.ieee.org>
- .42 MPI - The Master Painters Institute, 4090 Graveley Street, Burnaby, BC V5C 3T6 URL <http://www.paintinfo.com>
- .43 MSS - Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, N.E., Vienna, Virginia U.S.A. 22180-4602 URL <http://www.mss-hq.com>
- .44 NAAMM - National Association of Architectural Metal Manufacturers, 8 South Michigan Avenue, Suite 1000, Chicago, Illinois U.S.A. 60603 URL <http://www.naamm.org>
- .45 NABA - National Air Barrier Association, PO Box 2747, Winnipeg, Manitoba, R3C 4E7 URL <http://www.naba.ca>
- .46 NEMA - National Electrical Manufacturers Association, 1300 N. 17th Street, Suite 1847, Rosslyn, Virginia 22209 URL <http://www.nema.org>
- .47 NFPA - National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101 Quincy, Massachusetts, U.S.A. 02269-9101 URL <http://www.nfpa.org>
- .48 NFSA - National Fire Sprinkler Association, P.O. Box 1000, Patterson, New York, U.S.A. 12563 URL <http://www.nfsa.org>
- .49 NHLA - National Hardwood Lumber Association, 6830 Raleigh-La Grange Road, Memphis, TN, U.S.A 38184-0518 URL <http://www.natllhardwood.org>
- .50 NLGA - National Lumber Grades Authority, 406-First Capital Place, 960 Quayside Drive, New Westminster, B.C. V3M 6G2
- .51 NRC - National Research Council, Building M-58, 1200 Montreal Road, Ottawa, Ontario K1A 0R6 URL <http://www.nrc.gc.ca>
- .52 NSPE National Society of Professional Engineers, 1420 King Street, Alexandria, VA U.S.A. 22314-2794 URL <http://www.nspe.org>
- .53 PCI - Prestressed Concrete Institute, 209 W. Jackson Blvd., Suite 500, Chicago, Illinois, U.S.A. 60606-6938 URL <http://www.pci.org>
- .54 PEI - Porcelain Enamel Institute, PO Box 920220, Norcross, GA U.S.A. 30010 URL <http://www.porecelainenamel.com>
- .55 QPL - Qualification Program List, c/o Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, Quebec K1A 1G6 URL <http://www.pwgsc.gc.ca/cgsb>
- .56 RAIC Royal Architectural Institute of Canada, 55 Murray Street, Suite 330, Ottawa, Ontario, K1N 5M3 URL <http://www.raic.org>

- .57 SCC - Standards Council of Canada, 270 Albert Street, Suite 2000, Ottawa, Ontario K1P 6N7
URL <http://www.scc.ca>
- .58 SSPC - The Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh, Pennsylvania 15222-4656 URL <http://www.sspc.org>
- .59 TPI - Truss Plate Institute, 583 D'Onofrio Drive, Suite 200, Madison, WI, U.S.A. 53719
URL <http://www.tpinst.org>
- .60 UL - Underwriters' Laboratories, 333 Pfingsten Road, Northbrook, Illinois, U.S.A. 60062-2096 URL <http://www.ul.com>
- .61 ULC - Underwriters' Laboratories of Canada, 7 Crouse Road, Toronto, Ontario M1R 3A9
URL <http://www.ulc.ca>

END OF SECTION

Part 1 General

1.1 DOCUMENTS

- .1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 REQUIREMENTS

- .1 The Contractor shall provide, at its own cost, all necessary quality control testing that is required to demonstrate that the Work conforms to the Contract Documents.
- .2 The Contractor shall be responsible for all aspects of the quality of the Work, and shall put into place a suitable Quality Control Program to ensure that quality standards are met, and that the Work meets all the requirements and intent of the Contract Documents.
- .3 The Contractor shall provide equipment and qualified personnel to perform all quality control testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the Work.
- .4 Departmental Representative may carry out quality assurance testing and inspection in order to provide assurance that Work is generally in accordance with the Contract Documents and to verify the Contractor's quality control data.
- .5 Testing and inspection by Departmental Representative will not relieve the Contractor of its responsibility to perform quality control testing and inspection.
- .6 The cost of the Quality Control Program shall be included in the tender submission.

1.3 QUALITY CONTROL PROGRAM

- .1 Develop a Quality Control Program. The program requires review by the Departmental Representative.
- .2 Submit Quality Control Program to Departmental Representative within fourteen (14) days of Notice of Award.
- .3 Prior to commencing Work at the Work Site, the Contractor shall submit to the Departmental Representative for review and acceptance by the Departmental Representative and list of independent inspection agencies. The Quality Control Program shall include but not be limited to the following:
 - .1 Conformance with Specifications;
 - .2 Qualification statements for all tradespersons;
 - .3 Materials testing procedures and frequency of tests;
 - .4 Document control;
 - .5 Non-conformance tracking and remediation.
- .4 The Contractor shall engage services of independent inspection and testing laboratory with facilities and personnel that are certified to CSA, ASTM and other specified test methods for the sampling and testing of materials.

- .5 The Contractor shall prepare all test results in duplicate and provide copies of all tests to the Departmental Representative for review
- .6 All test results shall specify at least the following data:
 - .1 Type of test;
 - .2 Dates of sampling, testing and reporting;
 - .3 Personnel involved;
 - .4 Location of test (with sketch if required);
 - .5 Specified requirements;
 - .6 Test results;
 - .7 Remarks regarding conformance with Contract Documents.
- .7 Provide written test results to the Departmental Representative within twenty-four (24) hours of tests. If the tests are completed on the Work Site, provide the Departmental Representative with a field memo summarizing results immediately following testing.
- .8 Testing requirements shall be in accordance to industry standards and all applicable laws, regulations, standards and codes.
- .9 Test locations under this Section shall be determined by independent agencies working for the Contractor and shall be selected to test all aspects of the Work.
- .10 The Contractor shall report, track, correct, and retest any deficient Work determined by the Quality Control Program or quality assurance program at **NO** additional cost to the facility.
- .11 The Contractor's quality control testing will form the basis for acceptance of the Work, however the Departmental Representative may reject the Work based on its quality assurance testing.
- .12 Allow the Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .13 Give timely notice requesting inspection if Work is designated for special tests, inspections or acceptance by the Departmental Representative instructions, or law of Place of Work.
- .14 If the Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .15 The Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.4 INDEPENDENT INSPECTION AGENCIES (QUALITY ASSURANCE)

- .1 Particular requirements for inspection and testing to be carried out by testing service or in laboratory approved by Departmental Representative are specified under various sections.
- .2 Contractor will appoint and pay for services of testing laboratory including the following:

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities;
 - .2 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems;
 - .3 Factory tests and certificates of compliance;
 - .4 Tests specified to be carried out by Contractor under the supervision of Departmental Representative;
 - .5 Additional tests specified in paragraph following.
- .3 Where tests or inspections performed by the testing service reveal work is not in accordance with the contract requirements, Contractor shall pay costs for additional tests or inspections that the Departmental Representative may require to verify acceptability of corrected work.
 - .4 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.
 - .5 Provide Departmental Representative with one (1) copy of testing laboratory reports as soon as they are available.
 - .6 Allow inspection/testing agencies access to Work. Cooperate to provide reasonable facilities for such access.

1.5 REJECTED WORK

- .1 Remove defective Work, whether a result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by the Departmental Representative as failing to conform to the Contract Documents. Replace or re-execute in accordance with the Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of the Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with the Contract Documents, the Departmental Representative will deduct from the Contract Price the difference in value between rework performed and that called for by the Contract Documents, amount of which will be determined by the Departmental Representative.

Part 2 Products

Not Used.

Part 3 Execution

3.1 QUALITY CONTROL REPRESENTATIVE

- .1 The Contractor shall designate a Quality Control Representative to coordinate and implement the quality requirements.

3.2 PROCEDURES

- .1 Notify the Departmental Representative fourteen (14) days in advance of Factory Acceptance Testing, in order that attendance arrangements can be made.
- .2 Notify appropriate inspection/testing agency and the Departmental Representative forty-eight (48) hours in advance of the requirement for tests or inspection, in order that attendance arrangements can be made.
- .3 Provide labour and facilities to obtain and handle samples and materials at the Work Site.
- .4 Submit copies of inspection and test reports to the Departmental Representative in a timely manner.
- .5 Submit a completed copy of a typical “concrete pour card”, twenty-four (24) hours prior to the pouring of concrete as required by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 DOCUMENTS

- .1 This Section of the Specifications forms a part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

- .1 Not Used

1.3 REFERENCES

- .1 Not Used

1.4 SUBMITTALS

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

1.5 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities required to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.6 DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.7 WATER SUPPLY

- .1 Supply potable water as necessary for construction use.

1.8 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.

- .4 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .5 Permanent heating system of building may not be used.
- .6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform to applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .7 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.9 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools, and any other power requirements necessary for completion of the Work.
- .2 Provide and maintain temporary lighting necessary for the performance of the Work under this contract. Illumination levels shall be in accordance with WorkSafe BC requirements.

1.10 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

Part 2 Products

Not Used.

Part 3 Execution

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 35 33 – Health and Safety
- .2 Section 01 56 00 – Temporary Barriers and Enclosures.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1-GP-189-2000, Primer, Alkyd, Wood, Exterior.
 - .2 CGSB 1.59-2000, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA Group)
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA-0121--08 (R2013), Douglas Fir Plywood.
 - .3 CAN/CSA-Z321-96, Signs and Symbols for the Occupational Environment.

1.3 INSTALLATION AND REMOVAL

- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 WORK IN EXISTING BUILDING

- .1 Where required for building security and occupant safety, provide temporary hoarding as directed by Departmental Representative. Temporary hoarding must be reviewed and approved by Departmental Representative. Make changes if/ when requested.
- .2 Where noise and dust making activities are carried out, provide temporary hoarding as directed by Departmental Representative. Temporary hoarding must be reviewed and approved by Departmental Representative. Make changes if/ when requested.

1.5 SCAFFOLDING

- .1 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs, as required for performance of the Work.

1.6 HOISTING

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with subcontractors for use thereof.
- .2 Hoists and cranes shall only be operated by qualified operator.

1.7 SITE ACCESS AND CONTRACTOR LAYDOWN AREA

- .1 The work of this contract is within the perimeter of the existing facility.

- .2 The Departmental Representative will designate a contractor laydown area for this project, if required. The Contractor will be required to use this area only for construction operations. Note obtain and follow all rules and regulations.
- .3 Material and equipment deliveries will be through the existing loading area of the facility, without causing interruptions to the regular operation of the facility.
- .4 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .5 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.
- .6 Refer to Section 01 14 10 – Security Requirements for additional security requirements.
- .7 Refer to Section 01 35 33 – Health and Safety regarding contractor site plan drawing requirements

1.8 CONSTRUCTION PARKING

- .1 Parking will be permitted in areas designated by the Departmental Representative.
- .2 Provide and maintain adequate access to project site.
- .3 Provisions for equipment necessary for the Work of the project to be established when contractor moves on site.
- .4 Contractors' requirements and restrictions to be established when contractor moves on site.

1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials, where required.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.10 SANITARY FACILITIES

- .1 Provide sanitary facilities for workers in accordance with governing regulations and ordinances, or where otherwise advised by the Departmental Representative.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in a sanitary condition.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 35 33 – Health and Safety.
- .2 Section 01 52 00 – Construction Facilities.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.189M-84, Primer, Alkyd, Wood, Exterior.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-O121-08 (R2013), Douglas Fir Plywood.

1.3 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.4 HOARDING

- .1 Erect temporary site enclosures using 38mm x 89mm construction grade lumber framing at 600mm centres and 1200mm x 2400mm x 13mm exterior grade fir plywood to CSA O121.
- .2 Apply plywood panels vertically flush and butt jointed.
- .3 Provide one lockable truck entrance gate as directed and conforming to applicable traffic restrictions on adjacent roadways. Equip gates with locks and keys.
- .4 Erect temporary site enclosure using 1.2m high fence wired to rolled steel "T" bar fence posts spaced at 2.4m on centre. Provide one lockable truck gate. Maintain fence in good repair.
- .5 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.5 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs in accordance with WorkSafe BC regulations.

1.6 WEATHER ENCLOSURES

- .1 Provide weather tight closures to unfinished openings, tops of shafts and other openings in floors and roofs.
- .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

- .3 Design enclosures to withstand wind pressure and snow loading.

1.7 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public and staff operations. Requirements will be provided when the contractor moves on site.

1.8 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles. Detailed requirements will be provided when the contractor moves on site.
- .2 Refer to Section 01 35 33 – Health and Safety regarding Contractor site plan drawing requirements.

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect immediate adjoining site areas, surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred and repair damages at **NO** additional cost to the Contract.

1.10 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished buildings, partially finished buildings, existing structures, monuments and equipment during the performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule three (3) days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection and repair damages at **NO** additional cost to the Contract.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 42 00 – References.
- .2 Section 01 73 00 – Execution.

1.2 REFERENCE STANDARDS

- .1 Within text of specification sections, reference may be made to reference standards. List of standards reference writing organizations is contained in Section 01 42 00 – References.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost of such testing will be borne by the Departmental Representative and where Work is deemed unsatisfactory the incurred amount for the testing service will be deducted from the Contract Price.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of tender, except where specific date or issue is specifically noted or otherwise granted.

1.3 ACCEPTABLE PRODUCTS

- .1 Materials and products specified by "Prescriptive" or "Performance" specifications: select any material meeting or exceeding specifications.
- .2 Materials specified by reference standard: select any material meeting or exceeding the specified standard.
- .3 Materials specified under "Acceptable Materials" or "Acceptable Products" select any one of the indicated manufacturers, or any other manufacturer meeting or exceeding the Prescriptive specifications.
- .4 Where alternate materials or equipment are not listed as "Acceptable Materials" or "Acceptable Products", the Contractor is required to submit the complete alternate product information and data within their tender submission, to illustrate clearly to the facility and for their final review, and that the alternate product will indeed meet or exceed that of the "Acceptable Materials" or "Acceptable Products". Failure to do so will result in a non-compliant tender submission and maybe rejected.
- .5 When materials are specified by a reference standard or by a Prescriptive of Performance specification, upon request of Departmental Representative obtain from manufacturer an independent laboratory report showing that the material or equipment meets or exceeds the specified requirements.

1.4 SUBSTITUTION AFTER CONTRACT AWARD

- .1 No substitutions will be permitted without prior written approval of the Departmental Representative.
- .2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of items originally specified and the proposed substitution.
- .3 Proposals will be considered by Departmental Representative if:
 - .1 Materials selected by tenderer from those specified, are not available;
 - .2 Delivery date of materials selected from those materials specified would unduly delay completion of Contract; or
 - .3 Alternative material to that specified which is brought to the attention of and considered by Departmental Representative as equivalent to the material specified, and will result in a credit to the Contract amount, or, .an increase of value to the project.

1.5 QUALITY

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

1.6 AVAILABILITY

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

1.7 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .5 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.8 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Departmental Representative will be paid for by Departmental Representative. Unload, handle and store such products.

1.9 MANUFACTURER'S INSTRUCTIONS

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

1.10 QUALITY OF WORK

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

1.11 COORDINATION

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

1.12 CONCEALMENT

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

1.13 REMEDIAL WORK

- .1 Refer to Section 01 73 00 – Execution.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.14 LOCATION OF EQUIPMENT OR FIXTURES

- .1 Consider location of mechanical and electrical equipment or appurtenances indicated, as approximate. Ensure final placement is to the satisfaction of the facility operators. Request an on-site meeting with the facility to review the proposed final locations of equipment.
- .2 Immediately inform the Departmental Representative of conflicting installations and request further clarification or final direction prior to completing the Work.

1.15 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.16 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of any part of an existing building. Do not cut, drill or sleeve any load bearing structural member, unless with specific written approval of the Departmental Representative or the Marine Contractor (Prime or Site General Contractor).

1.17 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to services and the overall Work.
- .2 Protect, relocate or maintain existing active services, where necessary. When services are encountered, cap off in manner approved by the Authority Having Jurisdiction. Stake and record location of altered or capped services.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 11 00 – Summary of Work.
- .2 Section 01 33 00 – Submittal Procedures.
- .3 Individual product Sections: cutting and patching incidental to work of section. Advance notification to other sections required.

1.2 SUBMITTALS

- .1 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of the project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Departmental Representative or Separate Contractor.
- .2 Include in request:
 - .1 Identification of Project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Departmental Representative or Separate Contractor.
 - .7 Written permission of affected Separate Contractor.
 - .8 Date and time work will be executed.

1.3 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 – Submittal Procedures.

1.4 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of the Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

1.5 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of security and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore Work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 At penetration of fire-rated wall, ceiling, or floor construction, completely seal voids with approved firestopping systems or material, to the full thickness of the construction element (where applicable).
- .13 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
- .14 Conceal pipes, ducts and wiring in ground, floor, wall and ceiling construction of finished areas, except where indicated otherwise.

END OF SECTION

Part 1 General

1.1 DOCUMENTS

- .1 This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris for Work under this work package, and excluding that caused by the facility or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Departmental Representative. Do not burn waste materials on site, unless approved by the Departmental Representative.
- .3 Clear snow and ice from access to work areas. Bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Dispose of waste materials and debris off site.
- .7 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris for Work under this work package, and excluding that caused by the facility or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by the Departmental Representative. Do not burn waste materials on site, unless approved by the Departmental Representative.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Sweep and wash clean paved areas.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .2 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.
- .3 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .4 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .5 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modeling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .6 Salvage: Removal of structural and non-structural materials from deconstruction/ disassembly projects for purpose of reuse or recycling.
- .7 Separate Condition: Refers to waste sorted into individual types.
- .8 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.
- .9 Waste Audit (WA): Detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction. Indicates quantities of reuse, recycling and landfill.
- .10 Waste Reduction Workplan (WRW): Written report which addresses opportunities for reduction, reuse, or recycling of materials.

1.2 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:
 - .1 Waste Audit.
 - .2 Waste Reduction Workplan.
 - .3 Material Source Separation Plan.

1.3 MATERIALS SOURCE SEPARATION

- .1 Before project start-up prepare Materials Source Separation Program (MSSP) and provide containers to deposit re-usable and/or recyclable materials of the following:
 - .1 Metals;
 - .2 Wood;

- .3 Cardboard;
 - .4 Plastics;
 - .5 Other materials as indicated in technical sections.
- .2 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form:
- .1 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
 - .2 For each material reused, sold or recycled from project, include amount and the destination.
 - .3 For each material land filled or incinerated from project, include amount of material and identity of landfill, incinerator or transfer station.
- .3 Implement Materials Source Separation Program (MSSP) for waste generated on project in compliance with methods as approved by Departmental Representative.
- .4 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .5 Provide inventory of quantities of demolition materials to be salvaged for reuse, recycling, or disposal.

1.4 DIVERSION OF MATERIALS

- .1 Create a list of materials for separation from the general waste stream and stockpiled in separate containers, in compliance with fire regulations and to Departmental Representative's approval.
- .2 Mark containers and provide instruction on disposal practices.

1.5 STORAGE, HANDLING AND APPLICATION

- .1 Conform to Waste Reduction Work Plan.
- .2 Handle waste materials not being reused, salvaged or recycled in accordance with authority having jurisdiction and fire regulations.
- .3 Collect, handle, store on site and transport off-site, all materials in separated condition, to an approved and authorized recycling facility.
- .4 Provide Departmental Representative with receipts indicating quantity of material delivered to landfill.
- .5 Except as specified otherwise, materials removed from the site become the contractor's responsibility.
- .6 On-site sale of salvaged/recycled material is not permitted.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 RELATED SECTIONS

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

1.3 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and all subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Departmental Representative's inspection.
- .2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested and adjusted, and are fully operational.
 - .4 Certificates required by Authorities Having Jurisdiction.
 - .5 Commissioning of the systems: final commissioning reports have been submitted to the Departmental Representative.
 - .6 Operations of systems have been demonstrated to facility personnel.
 - .7 Work is complete and ready for Final Inspection.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 45 00 – Quality Control.
- .2 Section 01 77 00 – Closeout Procedures.
- .3 Section 01 91 13 – Commissioning.
- .4 Section 01 91 41 – Demonstration and Training.

1.2 SUBMISSION

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Departmental Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 At the time of Interim Completion (four weeks prior to Substantial Performance) of the Work, submit to the Departmental Representative, two (2) draft copies of the Operating and Maintenance Manuals, in English.
- .5 At the time of Substantial Performance of the Work, submit to the Departmental Representative, two (2) updated copies of the Operating and Maintenance Manuals, in English.
- .6 At the time of Total Completion of the Work, submit to the Departmental Representative, the following Operating and Maintenance Manuals, in English.
 - .1 Electronic (soft) copies of the Operating and Maintenance Manual System as required as specified under clause 1.3. Provide four (4) sets (on either CD-R, or removable USB drive) of the Electronic Operating and Maintenance Manual System to the Departmental Representative.
 - .2 Printed (hard) copies of the Operating and Maintenance Manual System are required as specified under clause 1.4. Provide four (4) printed sets of the Operating and Maintenance Manual System to the Departmental Representative.
- .7 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .8 If requested, furnish evidence as to type, source and quality of products provided.
- .9 Defective products will be rejected, regardless of previous inspections. Replace products with **NO** additional cost to the contract.
- .10 Pay costs of transportation.

1.3 OPERATING AND MAINTENANCE MANUAL SYSTEM

- .1 In addition to the printed copies, submit provide an Operating and Maintenance Manual System as specified herein.
- .2 System Description and Requirements

- .1 All as constructed drawings and operation and maintenance (O&M) manuals listed under the Scope of Work shall be converted, where necessary, into Portable Document File (PDF) format for viewing using the Adobe Acrobat Reader or other compatible PDF viewing applications.
- .2 O&M data and as constructed drawings shall be classified by their corresponding disciplines, including:
 - .1 Electrical
 - .2 Mechanical
- .3 Under each discipline, data shall be grouped into the following four major categories:
 - .1 Basic Documents
 - .1 'Basic Documents' shall, according to the type of services or disciplines, include the full contents of each hard copy of the O&M manuals with the addition of Miscellaneous Maintenance Reports and Records, or as defined by the facility. In general the following shall be included, unless specifically excluded by the Departmental Representative:
 - .1 Introduction;
 - .2 Consultant/Contractor/Suppliers list;
 - .3 System(s) description;
 - .4 Testing and commissioning (T&C) reports;
 - .5 Equipment data (specification sheets);
 - .6 Manufacturers recommended maintenance;
 - .7 Permit copies;
 - .8 Contractor letter of Total Completion;
 - .9 Contractor dated warranty certificate;
 - .10 Completed Electrical Forms, as listed elsewhere in these specification sections or appendix;
 - .11 Other documents that may be requested/ stipulated by the Departmental Representative.
 - .2 Record Drawings
 - .1 Record drawings shall be converted from the original electronic design files, such as CAD, into PDF format.
 - .2 The Contractor shall retain the services of an appropriate supplier to prepare the final record drawings in AutoCAD formats and also converted to PDF format.
 - .3 Draft copies of the record drawings will be submitted at the time of Interim Performance for review by the Departmental Representative. Make corrections to the drawings, as required after the review has been returned.
 - .4 PDF files of the final record drawings shall be enhanced with the following bookmarks to zoom into legible views on the computer screen as a minimum:

- .1 Drawing number and title,
- .2 Drawing notes,
- .3 Major equipment locations.
- .3 Equipment Data
 - .1 Equipment data shall be classified into the following categories:
 - .1 Equipment submittals.
 - .2 Maintenance data.

1.4 PRINTED COPY MANUALS

- .1 Organize data in the form of an instructional manual complete with manufacturer's suggested maintenance recommendations and maintenance interval's.
- .2 Binders: slot-lock, screw or wire-bound, hard covered vinyl, with permanent embossed lettering, 219mm x 279mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents,' list title of project and identify subject matter of contents.
- .5 Arrange content by Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide complete and updated, 1:1 Scaled, CAD files in AutoCAD .DWG format on a two (2) CD-R's or removable USB drive with the O&M manuals. Obtain the original .DWG files from the Departmental Representative to make the corrections based on the record information. Bind all x-references to the main drawing file & include all .CTB file plotting & printing information.

1.5 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide
 - .1 Title of project;
 - .2 Date of submission;
 - .3 Names, addresses, and telephone and fax numbers of Contractor, Subcontractors, Suppliers with name of responsible parties;
 - .4 Schedule of products and systems, indexed to content of volume;
 - .5 Copy of hardware schedule and paint schedules, complete with the actual manufacturer, supplier and identification names and numbers;
 - .6 All extended guarantees, warranties, maintenance bonds, certificates, letters of guarantees, registration cards, as called for in the various sections of the specification;

- .7 Complete set of all final reviewed shop drawings;
 - .8 Certificates of inspection by Authorities having Jurisdiction;
 - .9 Test reports and certificates as applicable;
 - .10 Complete set of as constructed drawings.
- .2 For each product or system:
- .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 – Quality Control.
- .6 Training: Refer to Section 01 91 41 – Demonstration and Training.

1.6 RECORD DRAWINGS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site one (1) record copy of:
- .1 Contract drawings;
 - .2 Specifications;
 - .3 Addenda;
 - .4 Change Orders, Instructions and other modifications to the Contract;
 - .5 Reviewed shop drawings, product data, and samples;
 - .6 Field test records;
 - .7 Inspection certificates;
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Provide an electronic copy of as constructed drawings.

1.7 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, provided by Departmental Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract Drawings.
 - .4 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda, Instructions and Change Orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.8 EQUIPMENT AND SYSTEMS

- .1 Each item of equipment and each system: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panelboard circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Maintenance Requirements: include routine procedures and checking instructions.
- .5 Include manufacturer's printed operation and maintenance instructions.
- .6 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .7 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .8 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .9 Include test reports as specified in 01 91 13 – Commissioning.
- .10 Additional requirements: As specified in individual specification sections.

1.9 SPARE PARTS

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

1.10 MAINTENANCE MATERIALS

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

1.11 SPECIAL TOOLS

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

1.12 STORAGE, HANDLING AND PROTECTION

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

1.13 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible party.

- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work.
- .4 Except for items put into use with the facilities permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.

1.2 QUALITY ASSURANCE

- .1 Provide third-party commissioning agent(s) for mechanical electrical, and life-safety systems, if required by the manufacturer to maintain warranties, and where acceptable to the Departmental Representative. Provide costs of commissioning in tender price. Understand that this is a PWGSC requirement to suit Government of Canada, Treasury Board funding for infrastructure projects.

1.3 SUBMITTALS

- .1 Submit the name(s) of the commissioning agent proposed to perform commissioning and testing services, complete with references and corporate resume for whom will be doing the work on the project. Submit documentation to confirm agency(ies) compliance with quality assurance provision.
- .2 Upon completion of commissioning services, prepare and submit preliminary report. Prepare final report with corrections and completed work requested, at time of turnover. Submit three (3) copies and one electronic PDF file of final reports on approved forms.

1.4 PROCEDURES - GENERAL

- .1 Comply with procedural standards of certifying association under whose standard services will be performed.
- .2 Notify Departmental Representative three (3) days prior to beginning of operations.
- .3 Accurately record data for each step.
- .4 Report immediately to Departmental Representative any deficiencies or defects noted during performance of services.

1.5 FINAL REPORTS

- .1 Commissioning agent and/ or the Contractor to prepare final reports. Submit with Operation and Maintenance manuals, testing results and reports to Commissioning Agent for final submission to Departmental Representative.
- .2 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.
- .3 Identify each instrument used, and latest date of calibration of each.

1.6 COMMISSIONING AGENT'S RESPONSIBILITIES

- .1 Conduct testing and commissioning of the equipment in accordance with manufacturer's recommendations.

- .2 Conduct electrical testing in accordance with requirements in Division 26. Conduct mechanical testing in accordance with requirements in Division 22.
- .3 Conduct an area inspection and sign-off equipment in each area, based on the requirements stipulated in the specification and provide to the Departmental Representative the schedule of equipment inspected.
- .4 Area (Floats) inspections to include:
 - .1 Electrical equipment installation and operation;
 - .2 Mechanical equipment installation and operation.
- .5 Conduct an inspection of the completed Work including:
 - .1 Electrical systems;
 - .2 Mechanical system;
 - .3 and Maintenance Access, to the satisfaction of the facility.

1.7 PREPARATION

- .1 Provide instruments required for testing.
- .2 Make instruments available to Departmental Representative to facilitate spot checks during testing.
- .3 Retain possession of instruments and remove at completion of services.
- .4 Verify systems installation is complete and in continuous operation.
- .5 Verify lighting is turned on when lighting is included in cooling load.

1.8 EXECUTION

- .1 Conduct an area inspection for the completed mechanical and electrical equipment/systems.
- .2 Test equipment and adjust as required.
- .3 For schedule of systems requiring testing, start up and verification refer to Divisions 22 and 26, where it applies to the mechanical and electrical systems.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 78 00 – Closeout Submittals.
- .3 Section 01 91 13 – Commissioning.

1.2 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to the facility's operating personnel, two (2) weeks prior to date of Interim Completion.
- .2 Departmental Representative will provide list of facility personnel to Contractor and coordinate dates and times.

1.3 QUALITY CONTROL

- .1 When specified in individual specification sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct facility personnel, and provide written report that demonstration and instructions have been completed.

1.4 SUBMITTALS

- .1 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
- .2 Submit reports within one (1) week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .3 Give time and date of each demonstration, with list of persons present.

1.5 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation.
- .2 Testing and adjusting have been performed in accordance with Section 01 91 13 – Commissioning and that equipment and systems are fully operational.
- .3 Provide copies of completed Operation and Maintenance manuals for use in demonstrations and instructions.

1.6 PREPARATION

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

1.7 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.

- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.
- .5 Contractor shall allow for four (4), one half to one hour, in-class training sessions with an estimated six (6) participants per session. This shall be for the manufacturers training and demonstration of the new connection procedures at the power pedestals. Contractor and manufacturer to provide the training materials (illustrated hand-outs) for the in-class sessions to be circulated to the attendee's. Contractor shall provide an attendance log and a checklist of items covered in the training session for Departmental purposes.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 General requirements for supplying and processing of aggregates to be stockpiled or incorporated into work.
- .2 Requirements for physical properties of various types of aggregate are given in related work Sections.

1.2 RELATED SECTIONS

- .1 Section 01 35 43 – Public Impact and Environmental Mitigation.
- .2 Section 31 22 13 – Rough Grading.
- .3 Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.4 SUBMITTALS

- .1 Quality Control:
 - .1 Submit to Departmental Representative testing results as per the requirements of Clause 1.14 of Section 01 35 43 – Public Impact and Environmental Mitigation, from an Independent Testing Agency confirming that the materials meet the Canadian Council of Ministers of the Environment (CCME) Industrial Land (IL) Usage Soil Quality Guidelines and the British Columbia Contaminated Sites Regulation (BC CSR) Schedule 7, Standards Triggering Contaminated Soil Relocation Agreements, Soil Relocation to Non Agricultural Land.
 - .2 The Contractor shall be responsible for providing Certificates of Analysis from a Canadian Association for Laboratory Accreditation Inc. (CALA) certified laboratory for all imported fill materials certifying that the materials meet the Canadian Council of Ministers of the Environment (CCME) Industrial Land (IL) Usage Soil Quality Guidelines and the British Columbia Contaminated Sites Regulation (BC CSR) Schedule 7, Standards Triggering Contaminated Soil Relocation Agreements, Soil Relocation to Non Agricultural Land.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Provide samples as and when requested by Departmental Representative.
- .3 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert unused granular materials from landfill to local quarry or facility.

Part 2 Products

2.1 MATERIALS

- .1 Materials brought onsite to originate from a clean source, and meet the Canadian Council of Ministers of the Environment (CCME) Industrial Land (IL) Usage Soil Quality Guidelines and the British Columbia Contaminated Sites Regulation (BC CSR) Schedule 7, Standards Triggering Contaminated Soil Relocation Agreements, Soil Relocation to Non Agricultural Land.
- .2 All imported fill material, regardless of type, shall meet the requirements shown in specification Section 01 35 43 – Public Impact and Environmental Mitigation, part 1.15, prior to arrival on-site.
- .3 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .4 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed five (5) times least dimension.
- .5 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .6 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates at least two (2) weeks prior to commencing production.
- .2 If, in opinion of Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Departmental Representative two (2) weeks in advance of proposed change of material source.
- .4 Acceptance of material source does not preclude future rejection if material fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 PREPARATION

- .1 Handling
 - .1 Handle and transport aggregates to avoid segregation, contamination, and degradation.
- .2 Stockpiling
 - .1 Stockpile aggregates on site in locations directed by Departmental Representative. Do not stockpile on completed pavement surfaces.
 - .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
 - .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
 - .6 Stockpile materials in uniform layers of thickness as follows:
 - .1 Max 1.5 m for coarse aggregate and base course materials.
 - .2 Max 1.5 m for fine aggregate and sub-base materials.
 - .3 Max 1.5 m for other materials.
 - .7 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
 - .8 Do not cone piles or spill material over edges of piles.
 - .9 Do not use conveying stackers.
 - .10 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 35 43 – Public Impact and Environmental Mitigation.

1.2 REFERENCES

- .1 U.S. Environmental Protection Agency (EPA)/ Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent facilities and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

- .1 Ensure that procedures are conducted in accordance with applicable Federal, Provincial, and Municipal requirements.
- .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3 Handle topsoil only when it is dry and warm.
- .4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by composting.
- .5 Remove brush from targeted area by non-chemical means and dispose of through mulching.
- .6 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Avoid mixing topsoil with subsoil.
 - .2 Stockpile height not to exceed 1.5m.
- .7 Dispose of unused topsoil on site, in a location selected by the Departmental Representative, at the Contractor's expense.

- .8 Protect stockpiles from cross-contamination between aggregate types and compaction during construction.
- .9 Cover topsoil that has been piled for long term storage as directed and approved by the Departmental Representative.

3.3 PREPARATION OF GRADE

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur; do not begin work until instructed by Departmental Representative.
 - .1 Grade area only when soil is dry to lessen soil compaction.
 - .2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

- .1 Refer to Section 32 91 21 – Topsoil Placement and Grading.
- .2 Place topsoil only after Departmental Representative has accepted subgrade.
- .3 Spread topsoil during dry conditions in uniform layers not exceeding 200mm, over unfrozen subgrade free of standing water.
- .4 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .5 Cultivate soil following spreading procedures.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 General requirements for rough grading the site in preparation for surface improvements.

1.2 RELATED SECTIONS

- .1 Section 31 23 16.26 – Rock Removal
- .2 Section 31 23 33.01 – Excavating, Trenching, and Backfilling

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D698- 12, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m).

1.4 EXISTING CONDITIONS

- .1 Known underground and surface utility lines and buried objects are as indicated on site plan. Contractor is responsible to verify all site utility locations prior to construction.
- .2 Refer to dewatering in Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.5 PROTECTION

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

Part 2 Products

2.1 MATERIALS

- .1 Fill material: Type 3 in accordance with of Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

Part 3 Execution

3.1 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Rough grade to depths as shown on contract drawings.
- .3 Slope rough grade away from building.
- .4 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

- .5 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:
 - .1 95% (minimum) under landscaped areas.
 - .2 100% under paved and walk areas.
- .6 Do not disturb soil within branch spread of trees or shrubs to remain.

3.2 TESTING

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by ULC. Costs of tests will be paid by contractor. Refer to Section 01 45 00 – Quality Control.
- .2 Submit testing procedure, frequency of tests, testing laboratory as designated by ULC or certified testing personnel to Departmental Representative for review and approval.

3.3 SURPLUS MATERIAL

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping off site by the contractor at the contractors expense.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 The work shall consist of excavation and stockpiling of suspect contaminated material at the Departmental Representative's designated storage area on site.

1.2 RELATED SECTIONS

- .1 Section 01 35 15 – Special Procedures for Contaminated Sites.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 2487 (2000), Classification of Soils for Engineering Purposes (Unified)
 - .2 ASTM D 5434 (1997), Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock.
- .2 BC Ministry of Environment Technical Guidance Document 1, Site Characterization and Confirmation Testing.

1.4 DEFINITIONS

- .1 Uncontaminated Soil – Materials that have been sampled, tested and determined by the Departmental Representative to contain metal, hydrocarbon and/or volatile organic compounds at concentrations less than the British Columbia CSR IL Standards and/or the CCME criteria.
- .2 Known Contaminated Soil – Materials that have been sampled, tested and determined by the Departmental Representative to contain metal, hydrocarbon and/or volatile organic compounds contaminants exceeding the CSR and/or CCME standards based on site investigations
- .3 Confirmed Contaminated Soil – Materials that have been excavated, segregated and stockpiled by the Contractor and; sampled and tested by the Departmental Representative according to BC Environment "Guidance on Contaminated Site, Site Characterization and Confirmation Testing" and determined to contain metal hydrocarbon and/or volatile organic compounds at concentrations in excess of the British Columbia CSR IL Standards and/or the CCME criteria.
- .4 Confirmed Special Waste – Materials that have been excavated, segregated and stockpiled by the Contractor and; sampled and tested by the Departmental Representative and found to contain metals and/or Hydrocarbon contaminates exceeding the standards defined in the Special Waste Regulations of British Columbia.
- .5 Waste Manifest (Tracking Form): A document that will allow tracking of individual truckloads of confirmed contaminated soil leaving the site. The Waste Manifest must be signed upon transfer of the materials and at the final disposal location. The Departmental Representative is to be provided with a copy of all Waste Manifests and weight scale receipts.

1.5 POTENTIALLY CONTAMINATED SOIL

- .1 The soils at the Institute of Ocean Sciences may contain contaminants such as hydrocarbons and metals. Contractor is to take appropriate measures as per Section 01 35 15 – Special Procedures for Contaminated Sites and Section 01 35 33 – Health and Safety for excavation work.
- .2 All excavated soil under this contract shall be treated as potentially contaminated soil. Excavate, handle and store excavated soil as per this Section and all other related sections.

1.6 SUBMITTALS

- .1 Provide submittals as required in Section 01 35 15 – Special Procedures for Contaminated Sites.

1.7 SCHEDULING

- .1 The Contractor shall notify the Departmental Representative two (2) working days prior to the start of excavation of known or suspect contaminated material.

Part 2 Products

2.1 MATERIALS

- .1 Furnish all necessary materials, at a minimum furnish:
 - .1 8-mil minimum plastic sheeting for base of any stockpiles;
 - .2 8-mil plastic sheeting for covering of contaminated soil in any stockpiles.

Part 3 Execution

3.1 EXISTING STRUCTURES AND UTILITIES

- .1 No excavation shall be performed until site utilities have been field located. The Contractor shall take the necessary precautions to ensure no damage occurs to existing structures and utilities. Damage to existing structures and utilities resulting from the Contractor's operations shall be repaired at no additional cost. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without approval from the Departmental Representative.

3.2 CONTAMINATED MATERIAL REMOVAL

- .1 Excavation
 - .1 Excavated soils shall be segregated and stockpiled as directed by the Departmental Representative or as per direction from PWGSC Environmental services personnel. Excavation shall be performed in a manner that will limit the potential for contaminated material to be mixed with uncontaminated material. An excavation log describing visible signs of contamination encountered shall be maintained for each area of excavation. Excavation logs shall be prepared in accordance with ASTM D 5434.

- .2 Soils must be stockpiled and characterized in accordance with the above referenced.
- .3 Disposal documentation of soil volumes, characterization results and disposal locations must be provided to the Departmental Representative.
- .2 Dewatering
 - .1 Surface water shall be diverted to prevent entry into the excavation. Dewatering shall be limited to that necessary to assure adequate access, a safe excavation, prevent the spread of contamination, and to ensure that compaction requirements can be met.

3.3 CONTAMINATED SOIL HANDLING

- .1 Soil Segregation
 - .1 Excavate known or suspect contaminated material and place in stockpile at storage area designated by Departmental Representative. In no case will the material be transported off site before laboratory analysis has been received and excavated materials have been characterized for disposal.
 - .2 Segregate excavated soils into separate stockpiles as directed by the Departmental Representative or as per direction from PWGSC Environmental services personnel. Construct stockpiles on a double layer of 8-mil polyethylene sheeting. Cover the stockpiles with a single layer of 8-mil polyethylene sheet at the end of each workday. Secure sheet to prevent disturbance by wind. Maintain the stockpile and replace the cover, if damaged. Grade surrounding surface to provide for positive drainage away from the pile. Maintain covering and grading for as long as stockpile exists.
- .2 Soil Testing
 - .1 Testing of excavated soil will be performed by the Departmental Representative. Soil will be assessed for indications of contamination and will be classified as confirmed contaminated soil, special waste soil, or uncontaminated soil.
 - .2 The Departmental Representative will dispose of the excavated soil material after testing is completed, according to applicable rules and regulations.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Requirements for:
 - .1 Trenching in the rock.

1.2 RELATED SECTIONS

- .1 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.3 MEASUREMENT PROCEDURES

- .1 Rock quantities measured will be in cubic metres of actual volume removed within the neat lines of excavation indicated on the drawings. Measurement will be to the neat lines of trenching in the rock.
- .2 All rock breaking and removal will be measured and verified by Departmental Representative and paid according to the Contractor's submitted unit costs.

1.4 DEFINITIONS

- .1 Rock: any sound or solid mass material in excess of 1.0 cubic metre, of such hardness and texture that it cannot be effectively loosened or broken down by mechanical ripping equipment with a minimum drawbar pull of 360 kN and/or by means of heavy duty excavation equipment. Frozen material is not classified as rock.
- .2 Unauthorized Rock Removal: Removal of rock below 0.2m from the elevation, alignment and profiles on the contract documents.

1.5 SUBMITTALS

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

1.6 BLASTING AND VIBRATION CONTROL

- .1 No blasting will be allowed onsite. All rock removal will be by mechanical means.

1.7 PROTECTION

- .1 Protect existing roads and structures.
- .2 Supply and use dust collection devices during all rock removal activities to minimize dust generated.
- .3 Take all necessary precautions to ensure that existing utilities are not damaged by the rock removal.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Product Requirements and with manufacturer's written instructions.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 NOT USED.

Part 3 Execution

3.1 ROCK REMOVAL

- .1 Remove rock to alignments, profiles, and cross sections. Correct unauthorized rock removal exceeding 0.2m from the design elevations by placing concrete as specified at no additional cost to PWGSC. Rock removal to be carried out by mechanical ripping equipment, hydraulic splitting or other appropriate method approved by Departmental Representative.
- .2 Use rock removal procedures to produce uniform and stable excavation surfaces, minimize overbreak, and avoid damage to adjacent structures.
- .3 Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.
- .4 Excavate trenches to lines and grades to minimum of 300mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe. Cut trenches to widths as indicated.
- .5 At the discretion of the Departmental Representative, the Contractor may be allowed to correct unauthorized rock removal at no extra cost, in accordance with this section and Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

3.2 CLEANING

- .1 Clean in accordance with Section 01 74 11 – Cleaning.
- .2 Undisturbed rock meeting the excavation elevations shall be cleaned of all overburden and blown clean using a combination of compressed air and water.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

3.3 ROCK DISPOSAL

- .1 Dispose of all excavated rock off-site by the contractor at the contractor's expense.

3.4 PROTECTION

- .1 Prevent damage to surroundings and injury to persons in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 General requirements for excavating and backfilling procedures.

1.2 RELATED SECTIONS

- .1 Section 01 35 43 – Public Impact and Environmental Mitigation.
- .2 Section 31 05 16 – Aggregate Materials.
- .3 Section 31 23 16.26 – Rock Removal.
- .4 Appendix B - Thurber Engineering Ltd. Institute of Ocean Sciences Marine Side Electrical Upgrade Geotechnical Assessment dated March 10, 2016.

1.3 UNSUITABLE FOUNDATION REPLACEMENT – PROVISIONAL UNIT RATE ITEM (WHERE APPLICABLE)

- .1 Unsuitable Foundation Replacement shall include excavation of unsuitable material as identified as unsuitable by the Departmental Representative below that of the design elevation outlined in the contract documents including but not exclusive to 300mm below the pipe invert design elevation, and below any design elevation as a result of excavation within the limit of construction. Unsuitable foundation replacement includes loading, hauling and disposal offsite at a location determined by the contractor at the contracts expense, and supply, placement, and compaction of Type 3 – select subgrade material placing, compaction, sheeting, shoring, and all incidental work for which payment is not specified elsewhere. Payment will be made only when authorized by the Departmental Representative in writing and witnessed / signed-off by the Departmental Representative.
- .2 Measurement: Actual width, depth and length in-situ of unsuitable material excavated as required volume calculation will be completed by the contractor at the contractor's expense and submitted to the Departmental Representative for review and confirmation.

1.4 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117- 04, Standard Test Method for Material Finer than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136- 06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422- 63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m).
 - .5 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-08, Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .5 WorkSafe BC Health and Safety act and regulations.
- .6 Canadian Council of the Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines.
- .7 BC Ministry of Environment (BC MoE), pursuant to the Environmental Management Act (EMA, SBC 2003 Chapter 53, current to June 22, 2011).
 - .1 The Contaminated Site Regulation (CSR, BC Reg. 375/96, O.C. 1480/96 and M271/2004, including amendments up to BC Reg. 97/2011, May 31, 2011).
 - .2 Hazardous Waste Regulation (HWR, BC Reg.63/88, O.C. 268/88, including amendments up to BC Reg. 63/2009, April 1, 2009), which includes standards for total concentrations of select substances as well as leachate quality standards.
 - .3 Standards Triggering Contaminated Soil Relocation Agreements (CSRA, Schedule 7).
- .8 Transportation of Dangerous Goods Regulations.

1.5 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: any sound or solid mass material in excess of 1.0 cubic metre, of such hardness and texture that can only be effectively loosened or broken down by mechanical ripping equipment and/or by means of heavy duty excavation equipment. Frozen material is not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation, also known as “Soil”.
- .2 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25mm in any dimension.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area and required for construction of fill areas or for other portions of Work and approved for use by the Departmental Representative.

- .5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas and approved for use by the Departmental Representative.
- .6 Unsuitable materials:
 - .1 Weak, chemically contaminated, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index higher than 10 when tested to ASTM D4318, and classified as CL, CH, CL-ML, ML, and SM with material fine than 0.02mm exceeding 15%.
 - .2 Coarse grained soils containing more than 20% by mass passing 0.075mm sieve.
- .7 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.
- .8 Classification of soils:
 - .1 “Free release” or Sched.7: Soil analytical chemical concentrations less than CSR Schedule 7 and CSR IL standards in Schedules 4, 5 and 10. No CSRA is required.
 - .2 “Industrial Quality” or IL: Soil analytical chemical concentrations greater than CSR Schedule 7 but less than CSR IL standards in Schedule 4, 5 and 10. A CSRA is required unless soils are being transported to and disposed of at a permitted waste facility.
 - .3 “Waste” or IL+: Soil analytical chemical concentrations greater than CSR Schedule 7 and/or CSR IL standards in Schedules 4, 5 and 10 but less than standards in the HWR. Soil must be disposed of at a permitted waste facility.
 - .4 “Hazardous Waste” or HW: Soil analytical chemical concentrations greater than standards in the HWR. Soil must be disposed of at a permitted hazardous waste facility.

1.6 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 – Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Notify Departmental Representative when bottom of excavation is reached.
 - .3 Submit to Departmental Representative testing and inspection results and report as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
 - .1 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority and location plan of relocated and abandoned services, as required.

1.7 QUALITY ASSURANCE

- .1 Engage services of qualified professional engineer who is registered or licensed in Province of British Columbia, Canada, in which Work is to be carried out to design and inspect shoring, bracing and underpinning required for Work.
- .2 Submit design and supporting data at least two (2) weeks prior to beginning Work.
- .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of British Columbia, Canada.
- .4 Keep design and supporting data on site.
- .5 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 33 – Health and Safety.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Divert excess aggregate materials from landfill to local quarry, recycling facility for reuse.

1.9 EXISTING CONDITIONS

- .1 Examine existing conditions and information included with Contract Documents.
- .2 Buried services:
 - .1 Before commencing work verify and establish location of buried services on and adjacent to site.
 - .2 Remove obsolete buried services within 2m of new water line: cap cut offs.
 - .3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .4 Prior to beginning excavation Work, notify Departmental Representative and authorities having jurisdiction and establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during Work.
 - .5 Confirm locations of buried utilities by careful test excavations, soil hydrovac methods or other approved method.
 - .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative.
 - .8 Record location of maintained and abandoned underground lines.
- .3 Existing Buildings and Surface Features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, structures, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments, which may be affected by Work.

- .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
- .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Type 1 (bedding and pipe cushion), Type 2 (Granular Sub-base), Type 3 (Select Subgrade Material) and Type 4 (Granular Base) fill: properties to Section 31 05 16 – Aggregate Materials and the following requirements:

- .1 Crushed, pit run or screened stone, gravel, or sand.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2.
- .3 Table:

Sieve Designation	% Passing			
	Type 1	Type 2	Type 3	Type 4
75 mm	-	100	100	-
50 mm	-	-	70-100	-
37.5 mm	-	60-100	-	-
25 mm	100	-	50-100	-
19 mm	90-100	35-80	-	100
12.5 mm	65-85	-	-	75-100
9.5 mm	50-75	26-60	-	60-90
4.75 mm	25-50	20-40	22-100	40-70
2.36 mm	10-35	15-30	10-85	27-55
1.18 mm	6-26	10-20	-	16-42
0.600 mm	3-17	5-15	-	8-30
0.300 mm	-	-	-	5-20
0.075 mm	0-5	0-5	0-5	2-8

- .2 Type 2 Fill (Granular Sub-base): Properties as follows:
 - .1 Los Angeles degradation: to ASTM C 131. Max % Loss by mass: 40.
 - .2 Particles smaller than 0.02 mm: to ASTM D 422, Maximum 3%.
 - .3 Soaked CBR: to ASTM D 1883, Min 40 when compacted to 95% of ASTM D 698.

- .3 Type 3 Fill (Select Subgrade Pit Run Material): well-graded granular material, unfrozen and free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials meeting the requirements in the above table.
- .4 Type 4 Fill (Granular Base): Properties as follows:
 - .1 Los Angeles degradation: to ASTM C 131. Max. % loss by weight: 45.
- .5 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least one freshly fractured face. Material to be divided into ranges using methods of ASTM C 136.
- .6 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.5MPa at 28 days.
 - .2 Maximum cement content of 25 kg/m; with 40% by volume fly ash replacement.
 - .3 Minimum strength of 0.07 MPa at 24 h.
 - .4 Concrete aggregates: to CSA A23.1/A23.2.
 - .5 Cement: to CSA A3001, Type GU, MS.
 - .6 Slump: 160 to 200mm.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Refer to Section 01 35 43 – Public Impact and Environmental Mitigation, Part 1.3.8.

3.2 SITE PREPARATION

- .1 For details of required excavation and backfill requirements refer to Thurber Engineering Ltd. Institute of Ocean Sciences Marine Side Electrical Upgrade Geotechnical Assessment dated March 10, 2016, located in Appendix B of the project Specifications.
- .2 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .3 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 – Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.4 SOILS CLASSIFIED AS “WASTE OR IL+” AND “HAZARDOUS WASTE OR HW”

- .1 Refer to Section 01 35 43 – Public Impact and Environmental Mitigation, Parts 1.11 and 1.13.

3.5 STRIPPING OF TOPSOIL

- .1 Strip topsoil where required.
- .2 Strip topsoil to existing fill materials and native soil.
 - .1 Do not mix topsoil with existing fill or native soil.
- .3 Stockpile on site within the Limit of Construction of each stage of work.
 - .1 Stockpile height not to exceed 1.5m and should be protected from erosion.
- .4 Dispose of unused topsoil as directed by Departmental Representative.

3.6 STOCKPILING

- .1 Stockpile fill materials on site within the Limit of Construction of each stage of work.
- .2 Protect fill materials from contamination.
- .3 Protect fill materials from wet weather conditions, precipitation, and excessive moisture.
- .4 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.7 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 If required engage services of qualified professional engineer who is registered or licensed in the Province of British Columbia, Canada to design and inspect shoring and bracing required for Work.
- .2 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 33 – Health and Safety and Health and Safety Act for the Province of British Columbia, Canada, and WorkSafeBC requirements
- .3 Construct temporary Works to depths, heights and locations as required under the directions of qualified professional engineer responsible for such temporary Works.

3.8 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in accordance with Section 01 35 43 – Public Impact and Environmental Mitigation to approved collection areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.

3.9 EXCAVATION

- .1 Refer to Section 01 35 43 - Public Impact and Environmental Mitigation, Part 1.14

- .2 Excavate to neat lines, grades, elevations and dimensions as indicated.
- .3 Excavation must not cause bearing capacity failure and settlement of adjacent foundations.
- .4 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .5 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Do not obstruct flow of surface drainage or natural watercourses.
- .8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .9 Notify Departmental Representative when bottom of excavation is reached.
- .10 Obtain Departmental Representative's approval of completed excavation.
- .11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .12 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with Type 4 fill compacted to not less than 95% Standard Proctor maximum dry density.
 - .2 Fill under other areas with Type 3 fill compacted to not less than 95% of Standard Proctor maximum dry density.

3.10 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated and specified on Contract Drawings, geotechnical report and further indicated herein. Assume only imported fill can be used. Compaction densities are percentages of maximum densities obtained from ASTM D698.

3.11 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified on the contract drawings. Place bedding and surround material in unfrozen condition.

3.12 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 300mm loose thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 48 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 500mm.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum seven (7) days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.
- .6 Place unshrinkable fill in areas as indicated.
- .7 Consolidate and level unshrinkable fill with internal vibrators.

3.13 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 19 – Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated and as directed by Departmental Representative.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation as existing or indicated by the construction documents and Departmental Representative.
- .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

1.2 MEASUREMENT AND PAYMENT

- .1 Removal of existing asphalt pavement will be measured in square metres.
- .2 Payment under this item will include operations involved in removing, hauling and stockpiling designated pavement and cleaning of remaining pavement surface.

1.3 REFERENCES

- .1 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

Part 2 Products

2.1 EQUIPMENT

- .1 Use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

Part 3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sediment control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of local authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.
- .3 Protection: protect existing pavement and structures not designated for removal. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

3.2 REMOVAL

- .1 Remove existing asphalt pavement to lines and grades as indicated in the contract documents and by Departmental Representative in the field.
- .2 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.
- .3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.
- .4 Suppress dust generated by removal process.

3.3 FINISH TOLERANCES

- .1 Finished surfaces in areas where asphalt pavement has been removed to be within +/- 5 mm of grade specified but not uniformly high or low.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.
- .3 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.
- .4 Waste Management: separate waste materials for reuse and/or recycling in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 05 16 – Aggregate Materials.
- .2 Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

1.2 REFERENCES

- .1 British Columbia Ministry of Transportation and Infrastructure 2012 Standards for Highway Construction Section 502.
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C88-05, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C117-04, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C123-12, Standard Test Method for Lightweight Particles in Aggregate.
 - .4 ASTM C127-12, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .5 ASTM C128-12, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
 - .6 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM C207-06 (2011), Standard Specification for Hydrated Lime for Masonry Purposes.
 - .9 ASTM D2419-09, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - .10 ASTM D3203-11, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
 - .11 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
 - .12 ASTM D1559-89, Test Method for Resistance of Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
 - .2 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Samples: Submit samples in accordance with Section 01 33 00 – Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and stockpile aggregates in accordance with Section 31 05 16 – Aggregate Materials and erosion and sedimentation control plan.
- .2 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.
- .3 Stockpile fine aggregate separately from coarse aggregate.
- .4 Provide approved storage, heating tanks and pumping facilities for asphalt cement.
- .5 Stockpile crushed RAP separately in accordance with Section 31 05 16 – Aggregate Materials.
- .6 Protect and cover stockpiles of crushed RAP from rain to approval of Departmental Representative and in accordance with erosion and sedimentation control plan.
- .7 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Performance graded asphalt cement: to CGSB-16.3-M90, Grade 80-100.
- .2 Asphaltic concrete must meet the standards as set out in British Columbia Ministry of Transportation and Infrastructure 2012 Standards for Highway Construction Section 502.
- .3 Aggregates: in accordance with Section 31 05 16 – Aggregate Materials and Section 31 23 33.01 – Excavating, Trenching, and Backfilling and the following requirements:
 - .1 Crushed stone or gravel.
 - .2 Gradations: within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2.
 - .3 Table

Sieve Designation	Percentage Passing	
	Lower Course	Upper Course
25.0mm	100	-
19.0mm	-	100
12.5mm	70-85	84-99
9.5mm	-	73-88
4.75mm	40-65	50-68

2.36mm	32-53	35-55
1.18mm	26-44	27-46
0.600mm	18-36	18-36
0.300mm	10-26	10-26
0.150mm	4-17	4-17
0.075mm	3-8	3-8

- .4 Coarse aggregate: aggregate retained on 4.75mm sieve and fine aggregate is aggregate passing 4.75mm sieve when tested to ASTM C136.
- .5 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75mm sieve and stockpile separately from coarse aggregate.
- .6 Separate stockpiles for coarse and fine aggregates not required for sheet asphalt.
- .7 Do not use aggregates having known polishing characteristics in mixes for surface courses.
- .8 Sand equivalent: ASTM D2419. Min.: 40.
- .9 Magnesium Sulphate soundness: to ASTM C88. Max% loss by mass:
 - .1 Coarse aggregate: 15%.
 - .2 Fine aggregate: 18%.
- .10 Los Angeles abrasion: Grading B, to ASTM C131. Max % loss by mass:
 - .1 Coarse aggregate, surface course: 25%.
 - .2 Coarse aggregate, lower course: 35%.
- .11 Absorption: to ASTM C127. Max % by mass:
 - .1 Coarse aggregate, surface course: 1.75%.
 - .2 Coarse aggregate, lower course: 2.00%.
- .12 Loss by washing: to ASTM C117. Max % passing 0.075mm sieve:
 - .1 Coarse aggregate, surface course: 1.5.
 - .2 Coarse aggregate, lower course: 2.0.
- .13 Flat and elongated particles: to ASTM D4791, (with length to thickness ratio greater than 5): Max% by mass:
 - .1 Coarse aggregate, surface course: 10 %.
 - .2 Coarse aggregate, lower course: 10%.
- .14 Crushed fragments: at least 60 % of particles by mass within each of following sieve designation ranges, to have at least 2 freshly fractured faces. Material to be divided into ranges, using methods of ASTM C136 and ASTM C117.
- .15 Table

Passing		Retained on
25mm	to	12.5mm
12.5mm	to	4.75mm
- .16 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

- .4 Mineral filler:
 - .1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
 - .2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.
 - .3 Mineral filler to be dry and free flowing when added to aggregate.
- .5 Water: to approval of Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate installed are acceptable for asphalt paving in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 FOUNDATIONS

- .1 Foundations for paving comprise:
 - .1 200mm compacted thickness of granular sub-base Type II.
 - .2 100mm compacted thickness of granular base Type IV.
- .2 Compaction: compact each lift of granular material to 100% standard proctor dry density to ASTM D698. Maximum lift thickness: 150mm.

3.3 PAVEMENT THICKNESS

- .1 Pavements for roadways:
 - .1 Base course: 40mm.
 - .2 Wear course: 40mm.

3.4 PAVEMENT CONSTRUCTION

- .1 Application of prime coat
 - .1 Asphalt material: to CAN/CGSB-16.1 grade: RM-20, MC-70 or CAN/CGSB-16.2 grade: SS-1.
 - .2 Do not apply prime when air temperature is less than 10 °C or when rain is forecast within two (2) hours.
 - .3 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt prime material.
 - .4 Prevent overlap at junction of applications.
 - .5 Do not prime surfaces that will be visible when paving is complete.

- .6 Apply additional material to areas not sufficiently covered as directed by Departmental Representative.
 - .7 Keep traffic off primed areas until asphalt prime has cured.
 - .8 Permit prime to cure before placing asphalt paving.
- .2 Construction of asphalt concrete:
- .1 Obtain Departmental Representative's approval of base, existing surface, and prime coat prior to placing asphalt.
 - .2 Place asphalt mixtures only when air temperature is above 10 °C. Place overlay pavement only when air temperature is greater than 10 degrees.
 - .3 When temperature of surface on which material is to be placed falls below 10 °C, provide extra rollers as necessary to obtain required compaction before cooling.
 - .4 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
 - .5 Levelling courses to thicknesses required but not exceeding 40mm lifts.
 - .6 Where possible, do tapering and levelling where required in lower lifts. Overlap joints by not less than 300mm.
 - .7 Distribute material uniformly. Do not broadcast material.
 - .8 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.
 - .9 After placing and before rolling, check surface with templates and straightedges and correct irregularities.
 - .10 Provide heating equipment to keep hand tools free from asphalt. Control temperature to avoid burning material. Do not use tools at higher temperature than temperature of mix being placed.
 - .11 Roll asphalt continuously to average density not less than 97% of 75 blow Marshall density to ASTM D1559 without any individual test below 95%.
 - .12 Accomplish finish rolling with two-axle or three-axle tandem steel wheeled rollers while material is still warm enough for removal of roller marks. If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by Departmental Representative.
 - .13 Conduct rolling operations in close sequence.
 - .14 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
- .3 Surface preparation:
- .1 Prior to laying mix, clean surfaces of loose and foreign material.
 - .2 Adjust existing castings and protect from asphalt mix.

3.5 TRAFFIC MARKINGS

- .1 Paint parking space divisions and other pavement markings affected or damaged by the work in accordance with manufacturers recommendations and as indicated and to the satisfaction of the Departmental Representative.
- .2 Use paint thinner in accordance with manufacturer's requirements.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 General requirements for concrete walks, curbs, and gutters.

1.2 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-in-Place Concrete.
- .2 Section 31 05 16 – Aggregate Materials.
- .3 Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-04, Standard Test Method for Materials Finer than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D698-12, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600 kN-m/m³).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-M88, Sieves, Testing, Woven Wire, Metric Series.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.4 SUBMITTALS

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

Part 2 Products

2.1 MATERIALS

- .1 Concrete mixes and materials: in accordance with Section 03 30 00 – Cast-in-Place Concrete with the following criteria specific to this section:
 - .1 Hand formed and hand-placed concrete:
 - .1 Slump: 80mm
 - .2 Air Entrainment: 5 to 8%
 - .3 Maximum Aggregate Size: 20mm
 - .4 Minimum Cement Content: 35kg/m³
 - .5 Minimum 28 day compressive strength: 32MPa
 - .2 Reinforcing steel to be as per the contract documents or as instructed by the Departmental Representative.

- .3 Granular base: material to Section 31 23 33.01 – Excavating, Trenching and Backfilling and following requirements:
 - .1 Type 4 fill.
 - .2 Crushed stone or gravel.
 - .3 Gradations: within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.
- .4 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.
- .5 Fill material to underside of Granular Base: to Section 31 23 33.01 – Excavating, Trenching, and Backfilling and following requirements:
 - .1 Type 2 fill.
 - .2 Crushed stone or gravel.
 - .3 Gradations: within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

Part 3 Execution

3.1 SUB GRADE PREPARATION

- .1 Do grade preparation work in accordance with Section 31 23 33.01 – Excavating, Trenching, and Backfilling.
- .2 Place fill in maximum 150mm layers and compact to at least 100% of maximum dry density to ASTM D698.

3.2 GRANULAR BASE AND SUB-BASE

- .1 Obtain Departmental Representative's approval of subgrade before placing granular base and sub-base.
- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Compact granular base in maximum 150mm layers to at least 100% of maximum density to ASTM D698, to thicknesses specified on the contract drawings.

3.3 FORMWORK

- .1 Ensure steel forms of approved design and free from twists and warp.
- .2 Ensure wood forms of select dressed lumber, straight and free from defects and thoroughly cleaned.
- .3 Use flexible forms for all curves less than 60m radius.
- .4 Forms to be to shape, lines and full dimensions of work being formed.
- .5 Adequately brace forms to maintain specified tolerances after concrete is placed.

3.4 INSPECTION

- .1 Departmental Representative to approve formwork prior to pouring concrete.

3.5 CONCRETE

- .1 Obtain Departmental Representative's approval of granular base prior to placing concrete.
- .2 Do concrete work to match with existing facility standard.
- .3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding an approx. 3mm deep, by drawing broom in direction normal to centre line or to match existing adjacent concrete.
- .4 Provide edging with 10mm radius edging tool or to match existing adjacent concrete.
- .5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

3.6 TOLERANCES

- .1 Finish surfaces to within 3mm in 3m as measured with 3m straightedge placed on surface.

3.7 EXPANSION AND CONTRACTION JOINTS

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 1.5m.
- .2 Install expansion joints at intervals of 6m.
- .3 When sidewalk is adjacent to curb, make joints of curb, gutters, and sidewalk coincide.

3.8 ISOLATION JOINTS

- .1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

3.9 CURING

- .1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least one (1) day after placing, or sealing moisture in by curing compound as directed by Departmental Representative.
- .2 Where burlap is used for moist curing, place two (2) pre-wetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.10 BACKFILL

- .1 Allow concrete to cure for seven (7) days prior to backfilling or unless directed otherwise by the Departmental Representative.
- .2 Backfill to designated elevations with material as directed by Departmental Representative.

3.11 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 MATERIAL SUPPLIED BY CONTRACTOR

- .1 Contractor will supply growing medium delivered to job site in quantity necessary to make up required volume over and above available stockpiled topsoil.

1.2 RELATED SECTIONS

- .1 Section 01 35 43 – Public Impact and Environmental Mitigation.

1.3 REFERENCES

- .1 Guidelines for Compost Quality, Category A produced by the Canadian Council of the Ministers of the Environment (CCME), January 1996.
- .2 The Canadian System of Soil Classification, Third Edition, 1998.

1.4 DEFINITIONS

- .1 COMPOST: A mixture of soil and decomposing organic matter used as a fertilizer, mulch, or soil conditioner. Compost is processed organic matter containing 40% or more organic matter as determined by the Walkley-Black or LOI test. Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth C:N ratio below 35, and contain no toxic or growth inhibiting contaminants. Composed bio-solids must meet the requirements of the Guidelines for Compost Quality, Category A produced by the Canadian Council of the Ministers of the Environment (CCME), January 1996.

1.5 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert unused soil amendments from landfill to authorized facilities approved by the Departmental Representative.
- .2 Unused soil amendments shall not be disposed of in or near sewer systems, storm drainage system, into lakes, streams, or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 GROWING MEDIUM

- .1 Growing medium for sodded areas and planting beds: mixture of particulates, micro-organisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 Soil texture is based on The Canadian System of Soil Classification, to consist of 20 to 60% sand, minimum 7% clay, and contain 2 to 10% organic matter by weight.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 50mm diameter
 - .2 Course vegetative material, 10mm diameter and 100mm length occupying more than 2% of soil volume
 - .4 Consistency: friable when moist.

2.2 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 Fertility: major soil nutrients present in following amounts:
 - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - .5 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .6 Ph value: 6-7.
- .2 Sand: washed coarse silica sand, medium to course textured.
- .3 Organic matter: compost Category A, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .4 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0mm sieve, 50% passing 0.125mm sieve.
- .5 Fertilizer: industry accepted slow release organic medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species as defined by soil test.

2.3 QUALITY CONTROL

- .1 Contractor is responsible for amendments to supply growing medium as specified.
- .2 Testing of topsoil will be carried out by testing laboratory in accordance with Provincial standards. Contractor will pay for cost of tests as specified in Section 01 35 43 – Public Impact and Environmental Mitigation, item 1.13.

Part 3 Execution

3.1 PREPARATION OF EXISTING GRADE

- .1 Verify sub grades are as shown accurately on grading design sheets. If discrepancies occur, notify and do not commence work until instructed by Departmental Representative.
- .2 Distribute soil and/or growing medium, eliminating uneven areas and low spots, and ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 25mm above surface. Dispose of removed material off site.

3.2 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place growing medium after Departmental Representative has accepted subgrade.
- .2 Spread growing medium in uniform layers not exceeding 150mm.
- .3 Spread growing medium to following minimum depths after settlement.
 - .1 200mm for grassed areas.
- .4 Manually spread topsoil and/or growing medium around trees, shrubs and obstacles.

3.3 SOIL AMENDMENTS

- .1 Apply and thoroughly mix soil amendments into top 50mm of existing soil at rates recommended in the soil analyses.

3.4 FINISH GRADING

- .1 Eliminate rough spots and low areas, and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil and/or growing medium to required bulk density using equipment approved by the Departmental Representative. Leave surfaces smooth, uniform and firm against deep foot printing.

3.5 ACCEPTANCE

- .1 The Departmental Representative will inspect growing medium in place and determine acceptance of material, depth, and finish grading.

3.6 SURPLUS MATERIAL

- .1 Dispose of surplus growing medium off-site as directed by the Departmental Representative.

3.7 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 35 33 – Health and Safety.
- .3 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .4 Section 32 91 21 – Topsoil Placement and Grading.

1.2 ADMINISTRATIVE REQUIREMENTS

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

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 sod, and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 If chemical fertilizers are to be used, submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 33 – Health and Safety.
- .3 Samples
 - .1 Submit:
 - .1 Sod for each type specified.
 - .1 Install approved samples in one (1) square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
 - .2 Obtain approval of samples by Departmental Representative.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

1.4 QUALITY ASSURANCE

- .1 Qualifications
 - .1 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation or otherwise approved by the Departmental Representative.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with supplier's recommendations.
 - .2 Replace defective or damaged materials with new.
- .3 Develop Waste Reduction Workplan related to Work of this Section.
- .4 Packaging Waste Management: remove for reuse and return of pallets and or crates, as specified in Waste Reduction Workplan in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Commercial Grade Turf Grass Nursery
 - .1 Mow sod at height directed by Departmental Representative within 36 hours prior to lifting, and remove clippings.
 - .2 Not more than five (5) broadleaf weeds and up to 20% native grasses per 40 square metres.
 - .3 Density of sod sufficient so that no soil is visible from height of 1500mm when mown to height of 50mm.
- .2 Water
 - .1 Contractor to arrange access to hose bib and water connection.
- .3 Fertilizer
 - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.

2.2 SOURCE QUALITY CONTROL

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

Part 3 Execution

3.1 INSTALLERS

- .1 Use installers who can demonstrate experience installing grass sod and are approved by the Departmental Representative.

3.2 EXAMINATION

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

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.3 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 21 – Topsoil Placement and Grading.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil, or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade to match existing grades and contours plus or minus 15mm for Commercial Grade Turf Grass Nursery, surface to drain naturally.
- .4 Remove and dispose of weeds, debris, stones 50mm in diameter and larger, soil contaminated by oil, gasoline, and other deleterious materials, in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

3.4 SOD PLACEMENT

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

3.5 SOD PLACEMENT ON SLOPES AND PEGGING

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

3.6 FERTILIZING PROGRAM

- .1 Fertilize during establishment and warranty periods to the manufacturer's instructions.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.
 - .1 Clean and reinstate areas affected by Work.
- .3 Waste Management: separate waste materials for reuse, compost or recycling per Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling and compost containers and bins from site and dispose of materials at appropriate facility.
 - .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.

3.8 PROTECTION BARRIERS

- .1 Protect newly sodded areas from foot or vehicular traffic and deterioration as directed by Departmental Representative.
- .2 Remove protection two (2) weeks after installation or as directed by Departmental Representative.

3.9 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of installation until acceptance.
 - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75mm to 100mm.
 - .2 Cut grass to 50mm when or prior to it reaching height of 100mm or per the manufacturer's instructions whichever is more stringent.
 - .3 Maintain sodded areas weed free.
 - .4 Fertilize areas in accordance with manufacturer's recommended fertilizing program.
 - .5 Temporary barriers or signage to be maintained where required to protect newly established sod.

3.10 ACCEPTANCE

- .1 Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
 - .1 Sodded areas are properly established.
 - .2 Extent of surface soil visible when grass has been cut to height of 60mm is acceptable.

- .3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.
- .4 Sodded areas have been cut minimum two (2) times prior to acceptance.
- .5 Fertilizing in accordance with manufacturers recommended fertilizer program has been carried out at least once.
- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.
- .3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

3.11 MAINTENANCE DURING WARRANTY PERIOD

- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Water sodded Commercial Grade Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100mm.
 - .2 Repair and re-sod dead or bare spots to satisfaction of Departmental Representative.
 - .3 Cut grass and remove clippings as directed by Departmental Representative to height as follows:
 - .1 Commercial Grade Turf Grass Nursery Sod
 - .1 60mm during normal growing conditions.
 - .2 Cut grass at intervals so that approximately one third of growth is removed in single cut.
 - .3 Fertilize areas in accordance with manufacturer's recommended fertilizing program.
 - .4 Eliminate weeds by means acceptable to Departmental Representative.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 This section specifies the requirements of supply and installation of ducts and manholes for the electrical underground duct bank installation.

1.2 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 27 – Grounding and Bonding
- .3 Section 26 05 34 – Conduits, Conduit Fastenings, and Conduit Fittings.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .3 ASTM C139-05, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - .4 ASTM C 478/C478M-08e1, Standard Specification for Precast Reinforced Concrete Manhole Sections.
 - .5 ASTM D1056-07, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
- .2 Canadian Standards Association (CSA Group)
 - .1 CSA-C22.2 NO. 211.1-06 Rigid Types EB1 and DB2/ES2 PVC Conduit.
 - .2 CAN/CSA-C22.3 NO. 7-15 Underground systems.
 - .3 CAN/CSA-A3000-08 Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .4 CSA-A3001-08, Cementitious Materials for Use in Concrete.
 - .5 CSA-A23.1-09/A23.2-09 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .6 CSA-G30.18-09 Carbon Steel Bars for Concrete Reinforcement.
- .3 BC Hydro
 - .1 BC-Hydro ES54-2004 Underground Civil Standard.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Product Data

- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings
 - .1 Submit shop drawings for precast manholes and covers.
- .4 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 26 05 00 – Common Work Results for Electrical.

Part 2 Products

2.1 PVC DUCTS

- .1 PVC ducts
 - .1 Type DBII & Rigid Schedule 80 to Section 26 05 34 – Conduits, Conduit Fastenings, and Conduit Fittings.
 - .2 Encased in reinforced concrete or direct buried.

2.2 PVC DUCT FITTINGS

- .1 Rigid PVC opaque solvent welded type couplings, bell end fittings, plugs, caps, adaptors as required to make complete installation.
- .2 Expansion joints.
- .3 Rigid PVC 5 degree angle couplings.

2.3 MANHOLES GENERAL

- .1 Provide type indicated.
- .2 Top, walls, and bottom: reinforced concrete.
- .3 Walls and bottom: monolithic concrete construction.
- .4 Locate duct entrances and windows near corners of structures to facilitate cable racking.
- .5 Covers: fit frames without play.
- .6 Form steel and iron to shape and size with sharp lines and angles.
- .7 Castings: warp and blow hole free.
- .8 Exposed metal: smooth finish without sharp lines and arises.
- .9 Provide lugs, rabbets, and brackets.
- .10 Set pulling-in irons and other built-in items in place before depositing concrete.
- .11 Install pulling-in iron in wall opposite each duct line entrance.

- .12 Cable racks, including rack arms and insulators: sized to accommodate cable.

2.4 PRECAST CONCRETE MANHOLES AND TRANSFORMER PADS

- .1 Precast concrete manholes/transformer pads and auxiliary sections fabricated in steel forms.
- .2 Aggregates: to CSA A23.1/A23.2.
- .3 Cement: CAN/CSA-A3001, Type GU.
- .4 Steel welded wire fabric mesh reinforcing: to ASTM A82/A82M, ASTM A185/A185M and CAN/CSA-G30.18.
- .5 Pulling inserts and bolts for racks integrally cast in concrete.
- .6 Neoprene gasket seals between manhole sections: to ASTM D1056.
- .7 Opening size for cover: 762mm clear diameter or as indicated.
- .8 Precast Concrete Manholes: to ASTM C478/C478M.
 - .1 Manhole step and ladder rung spacing: 405 or as indicated.

2.5 DRAINAGE

- .1 Floor drain fittings: consisting of floor drain, back water valve, trap and pipe connection to drainage system.
- .2 Sump pit: 300 x 300 x 125mm.

2.6 MANHOLE NECKS

- .1 Concrete brick and mortar.

2.7 MANHOLE FRAMES AND COVERS

- .1 Heavy duty traffic rated cast iron frames and covers.
 - .1 Vehicle traffic area or as indicated.
 - .2 Size: 915mm x 915mm clear opening or as indicated.
 - .3 Material: grey iron frame to ASTM A48-Class 35B and ductile iron cover to ASTM A536 or cast iron frame and cover to BC Hydro ES54.
 - .4 Complete with stainless steel spring assembly enabling smooth lift through entire range of operation without help of specific tool.
- .2 Light duty angle frame and checkered plate steel cover.
 - .1 Other than vehicle traffic area or as indicated.
 - .2 Size: 762mm x 762mm clear opening or as indicated.
- .3 Bolted on covers to prevent unauthorized entry.
- .4 Complete with integrated lift handle.

2.8 GROUNDING

- .1 Ground rods: in accordance with Section 26 05 28 - Grounding and Bonding for cable rack grounding.

2.9 CABLE RACKS

- .1 Hot dipped galvanized cable racks and supports.
- .2 12 x 100mm preset inserts for rack mounting.

2.10 CABLE PULLING EQUIPMENT

- .1 Pulling iron: galvanized steel rods, size and shape as indicated.
- .2 Pull rope: 6mm stranded polypropylene, tensile strength 5kN, continuous throughout each duct run with 3m spare rope at each end.

2.11 MARKERS

- .1 Concrete type cable markers: 600 x 600 x 100mm, with words: "Cable", "Joint", "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.
- .2 Cedar post type markers: 89 x 89mm square, 1.5m long, pressure treated with coloured, or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing duct.
 - .1 Nameplate: aluminum anodized 89 x 125mm, 1.5mm thick mounted on cedar post with Mylar label 0.125mm thick with words "Cable", "Joint", "Conduit" with arrows to indicate change in direction.

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 GENERAL

- .1 Install underground duct banks, concrete pullboxes and manholes including formwork.
- .2 Build duct banks and manholes on undisturbed soil or on well compacted granular fill not less than 150mm thick, compacted to 95% of maximum proctor dry density.
- .3 Open trench completely between manholes before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.
- .4 Prior to laying ducts, construct "mud slab" not less than 75mm thick.
- .5 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.
- .6 Install base spacers at maximum intervals of 1.5m levelled to grades indicated for bottom layer of ducts.
- .7 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 75mm horizontally and vertically.
 - .1 Stagger joints in adjacent layers at least 150mm and make joints watertight.
 - .2 Encase duct bank with 75mm thick concrete cover.

- .3 Use galvanized steel conduit for sections extending above finished grade level.
- .8 Make transpositions, offsets and changes in direction using 5 degree bend sections, do not exceed a total of 20 degree with duct offset.
- .9 Use bell ends at duct terminations in manholes or buildings.
- .10 Use conduit to duct adapters when connecting to conduits.
- .11 Terminate duct runs with duct coupling set flush with end of concrete envelope when dead ending duct bank for future extension.
- .12 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.
- .13 Allow concrete to attain 50% of its specified strength before backfilling.
- .14 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete.
 - .1 Tie ducts to spacers with twine or other non-metallic material.
 - .2 Remove weights or wood braces before concrete has set and fill voids.
- .15 Clean ducts before laying:
 - .1 Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.
- .16 Duct cleaning:
 - .1 Pull through each duct wooden mandrel not less than 300mm long and of diameter 6mm less than internal diameter of duct, immediately after placing of concrete.
 - .2 Then pull stiff bristle brush through duct to remove sand, earth and other foreign material.
 - .3 Avoid disturbing or damaging ducts where concrete has not set completely.
 - .4 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .17 Install four 3m lengths of 10M reinforcing rods, one in each corner of duct bank when connecting duct to manholes or buildings.
 - .1 Wire rods to 10M dowels at manhole or building and support from duct spacers.
 - .2 Protect existing cables and equipment when breaking into existing manholes.
 - .3 Place concrete down sides of duct bank filling space under and around ducts.
 - .4 Rod concrete with flat bar between vertical rows filling voids.
- .18 Install pull rope continuous throughout each duct run with 3m spare rope at each end.

3.3 CONCRETE PULLBOXES AND MANHOLES

- .1 Install precast pullboxes and manholes.
- .2 Concrete Placement:
 - .1 Place concrete in two (2) lifts with floor slab and sump in first, walls, roof and neck in second lift.
 - .2 Provide key in walls to slab.
 - .3 Place 100 x 6mm PVC water bar vertically in key.

- .4 Install ground rod before placing slab and place reinforcing steel, inserts for cable rack, pulling irons, drain, duct outlets, duct run dowels before casting walls. Make manhole to duct connection as indicated.
- .3 Provide 115mm deep window to facilitate cable bends in wall at each duct connection.
 - .1 Terminate ducts in bell-end fitting flush with window face.
 - .2 Provide four (4) 10M steel dowels at each duct run connection to anchor duct run.
 - .3 On runs of 16 ducts and over, support concrete duct encasement on a 700mm wide by 75mm thick concrete pier poured against manhole wall between slab and bottom of duct run, provide dowels for anchoring.
- .4 Alternately connect large duct runs by leaving square opening in wall, later pouring duct run and wall opening in one pour, and install 10m x 3m reinforcing rods in duct run at manhole connection.
- .5 Build up concrete manhole neck to bring cover flush with finished grade in paved areas and 40mm above grade in unpaved areas.
- .6 Install manhole frames and covers for each manhole:
 - .1 Set frames in concrete grout onto pullbox/manhole neck.
 - .2 Provide permanent label on pullbox/manhole cover for identification.
- .7 Drain floor towards sump with 1 to 48 slope minimum and install drainage fittings as indicated.
- .8 Install cable racks, anchor bolts and pulling irons as indicated.
- .9 Grout frames of manholes:
 - .1 Cement grout to consist of two (2) parts sand and one (1) part cement and sufficient water to form a plastic slurry.
- .10 Ensure filling of voids in joint being sealed.
 - .1 Plaster with cement grout, walls, ceiling and neck.
- .11 Spray paint "X" on ceiling of manhole above floor drain or sump pit.

3.4 DUCTBANK

- .1 Ductbank shall be provided with rebar and encased with 30 MPa concrete as shown in drawings.

3.5 MARKERS

- .1 Mark location of duct runs under hard surfaced areas not terminating in manhole with railway spike driven flush in edge of pavement, directly over run.
 - .1 Place concrete duct marker at ends of such duct runs.
 - .2 Construct markers and install flush with grade.
- .2 Mark ducts every 150m along straight runs and changes in direction.
- .3 Where markers are removed to permit installation of additional duct, reinstall existing markers.
- .4 Lay concrete markers flat and centered over duct with top 25mm above earth surface.
- .5 Provide drawings showing locations of markers.

3.6 FIELD QUALITY CONTROL

- .1 Site Tests/Inspections:
 - .1 Inspection of duct will be carried out by Departmental Representative prior to placing.
 - .2 Placement of concrete and duct cleanout to be done when Departmental Representative present.

3.7 CLEANING

- .1 Proceed in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Manhole shall be kept dry on completion of project.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 This section specifies the requirements of supply and installation of ducts for the direct buried electrical underground duct bank installation.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

- .1 Canadian Standards Association (CSA Group)
 - .1 CSA-C22.2 NO. 211.1-06 Rigid Types EB1 and DB2/ES2 PVC Conduit.
 - .2 CAN/CSA-C22.3 NO. 7-15 Underground systems.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .1 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
 - .2 Manufacturer's Instructions: for installation and special handling criteria, installation sequence and cleaning procedures.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 26 05 00 – Common Work Results for Electrical.

Part 2 Products

2.1 PVC DUCTS AND FITTINGS

- .1 Rigid PVC duct: Type DBII & Rigid Schedule 80 to Section 26 05 34 – Conduits, Conduit Fastenings, and Conduit Fittings
 - .1 Complete with moulded fittings, for direct burial expanded flange ends.
 - .2 Trade size: as indicated.
 - .3 Nominal length: 6m plus or minus 12mm.
- .2 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.
- .3 Rigid PVC 90 degrees, 45 degrees bends and 5 degrees angle couplings as required.
- .4 DBII concrete encased only.
- .5 Rigid Schedule 80 direct buried only.

2.2 SOLVENT WELD COMPOUND

- .1 Solvent cement for PVC duct joints.

2.3 CABLE PULLING EQUIPMENT

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

2.4 MARKERS

- .1 Concrete type cable markers: 600mm x 600mm x 100mm, with words: "Cable", "Joint", "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.
- .2 Cedar post type markers: 89mm x 89mm square, 1.5m long, pressure treated with coloured, or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing duct.
 - .1 Nameplate: aluminum anodized 89mm x 125mm, 1.5mm thick mounted on cedar post with Mylar label 0.125mm thick with words "Cable", "Joint", "Conduit" with arrows to indicate change in direction.

2.5 WARNING TAPE

- .1 Standard 4-mil polyethylene 76mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW".

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXCAVATING, TRENCHING AND BACKFILLING

- .1 Site preparation
 - .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits as necessary.
- .2 Preparation/protection
 - .1 Protect existing features in accordance with applicable local regulations.
 - .2 Keep excavations clean, free of standing water, and loose soil.
 - .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .4 Protect buried services that are required to remain undisturbed.
- .3 Excavation
 - .1 Excavation must not interfere with bearing capacity of adjacent foundations.
 - .2 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
 - .3 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30m of trench in advance of installation operations and do not leave open more than 15m at end of day's operation.
 - .4 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
 - .5 Restrict vehicle operations directly adjacent to open trenches.
 - .6 Do not obstruct flow of surface drainage or natural watercourses.
 - .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
 - .8 Notify Departmental Representative when bottom of excavation is reached.
 - .9 Obtain Departmental Representative approval of completed excavation.
 - .10 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
 - .11 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- .4 Bedding and surround of ducts
 - .1 Place sand for bedding and surround of ducts.
 - .2 Place bedding and surround material in unfrozen condition.

.5 Backfilling

.1 Do not proceed with backfilling operations until completion of following:

.1 Departmental Representative has inspected and approved installations.

.2 Inspection, testing, approval, and recording location of underground utilities.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 150mm compacted thickness up to grades. Compact each layer before placing succeeding layer.

.5 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed Work to equalize loading.

.6 Restoration

.1 Reinststate lawns to elevation which existed before excavation.

.2 Reinststate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.3 Clean and reinststate areas affected by Work as directed by Departmental Representative.

.4 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

3.3 INSTALLATION

.1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.

.2 Clean inside of ducts before laying.

.3 Install plastic duct spacers and ensure full, even support every 1.5m and smooth transition throughout duct length.

.4 Slope ducts with 1 to 400 minimum slope.

.5 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.

.6 Pull through each duct wooden mandrel not less than 300mm long and of diameter 6mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.

.1 Pull stiff bristle brush through each duct immediately before pulling-in cables.

.7 Install a pull rope continuous throughout each duct run with 3m spare rope at each end.

.8 Place continuous strip of warning tape 300mm below finished grade above duct before backfilling trenches.

- .9 Install markers as required.
- .10 Notify the Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning and Section 26 05 00 – Common Work Results for Electrical.
- .2 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for underground service ducts.

1.2 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 21 – Wire and Cables.
- .3 Section 26 05 28 – Grounding and Bonding.
- .4 Section 26 05 32 – Conduits, Conduit Fastenings and Fittings.
- .5 Section 26 05 44 – Installation of Cables in Ducts.
- .6 Section 33 65 73 – Concrete Encased Duct Banks and Manholes.
- .7 Section 33 65 76 – Direct Buried Underground Cable Ducts.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA Group)
 - .1 CSA-A23.1-09/A23.2-09 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-C22.3 NO. 7-15 Underground systems.

1.4 REGULATORY REQUIREMENTS

- .1 Coordinate and meet requirements of power supply authority. Ensure availability of power when required.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.6 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Regulatory Requirements:
 - .1 Perform Work to comply with applicable Provincial/Territorial regulations.
 - .2 Coordinate and meet requirements of power supply authority.
 - .1 Ensure availability of power when required.
- .3 Certificates: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

- .4 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 26 05 00 – Common Work Results for Electrical and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 26 05 00 – Common Work Results for Electrical.

Part 2 Products

2.1 MATERIALS

- .1 Concrete encased ductbanks and manholes to Section 33 65 73 – Concrete Encased Duct Banks and Manholes, Type EB1, size as indicated.
- .2 Conductors:
 - .1 Low voltage service: copper, type RWU-90, in accordance with Section 26 05 21 – Wire and Cables 0-1000V, size and number of conductors as indicated.
 - .2 MV service: Concentric Neutral Power Cables (25000V) in accordance with Section 25 05 14 - Power Cable and Overhead Conductors (Over 1000V).
- .3 Concrete: to CSA-A23.1-09/A23.2-09 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .4 Backfill: clean and free of debris.
- .5 Pulling Iron:
 - .1 22mm diameter hot dipped galvanized steel bar with exposed triangular shaped opening.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Install primary power ductbank for 25 kV distribution feeder from Main Electrical Room (Substation #1) as indicated.
 - .1 Use existing ductbanks and manholes/pullboxes as indicated.
 - .2 Concrete encased ductbanks and manholes to Section 33 65 73 – Concrete Encased Duct Banks and Manholes, Type EB1, size as indicated.

- .3 Provide concrete encasement for concrete encased ductbanks and manholes in accordance with CSA-A23.1-09/A23.2-09, where indicated on drawings.
- .2 Install secondary power ductbank for secondary service as shown in the drawings.
 - .1 Concrete encased ductbanks and manholes to Section 33 65 73 – Concrete Encased Duct Banks and Manholes, Type EB1, size as indicated.
 - .2 Provide concrete encasement for concrete encased ductbanks and manholes in accordance with CSA-A23.1-09/A23.2-09, where indicated on drawings.
 - .3 Direct buried underground ducts: to Section 33 65 76 – Direct Buried Underground Cable Ducts, rigid type DB2, size as indicated.
 - .4 Direct buried underground cables: to Section 26 05 21 – Wires and Cables, TECK Cable, size as indicated.
- .3 Install telecommunication ductbank from Telecommunication Manhole as shown in the drawings.
 - .1 Concrete encased ductbanks and manholes to Section 33 65 73 – Concrete Encased Duct Banks and Manholes, Type EB1, size as indicated.
 - .2 Provide concrete encasement for concrete encased ductbanks and manholes in accordance with CSA-A23.1-09/A23.2-09, where indicated on drawings.
 - .3 Direct buried underground ducts: to Section 33 65 76 – Direct Buried Underground Cable Ducts, rigid type DB2, size as indicated.
- .4 Install pulling irons as required.
- .5 Mandrill all duct and cap duct with 5mm nylon pull rope in each ductbank until it is ready for the installation of cables.
- .6 Install cables in trenches and in ducts/conduits in accordance with Section 26 05 44 – Installation of Cables in Ducts.
- .7 Provide ground conductor in each underground conduit or duct, ground conductor size shall be as indicated on drawings, size ground conductor in accordance with CEC if ground conductor is not indicated on drawing.
- .8 Allow adequate conductor length for connection to switchgear, power transformer, generator and service equipment.
- .9 Make grounding connections in accordance with Section 26 05 27 – Grounding - Primary for MV service and Section 26 05 28 – Grounding - Secondary for LV service.
- .10 Seal ducts and conduits at building entrance location after installation of cable.
 - .1 Stud-out duct or conduit at least 100mm from structural finish.
 - .2 Install heat-shrink type or cold-shrink at the duct or conduit stud-out for water tight sealing.
- .11 Seal unused empty ducts and conduits at building entrance location or manhole/pullbox by water tight plug or cap.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests
 - .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .2 Perform additional tests if required by authority having jurisdiction.

- .2 Submit written test results to Departmental Representative for review.

3.4 CLEANING

- .1 Clean in accordance with Section 26 05 00 – Common Work Results for Electrical and Section 01 74 11 – Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- .2 The General Conditions, Supplements, Amendments, and Mechanical General Requirements shall govern the plumbing sections of the work (read in conjunction with the Instructions to Tenderers). This section covers items common to the 22 00 00 series sections and is intended only to supplement the requirements of Division 1.
- .3 Plumbing drawings are diagrammatic and approximately to scale. They establish the scope of the plumbing work and the general location and orientation of the plumbing facilities. Plumbing facilities shall be installed generally in the locations and generally along the routings shown with minimum interference with other services.

1.2 RELATED WORK

- .1 Division 26 – Electrical.

1.3 CODES, STANDARDS AND APPROVALS

- .1 Installation, workmanship and testing shall conform to the following standards:
 - .1 National Building Code of Canada, current edition;
 - .2 National Plumbing Code of Canada, current edition.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.
- .2 Shop drawings are required for all materials and equipment including, but not limited, to the following:
 - .1 Plumbing permits.
 - .2 Pipe, fittings, and couplings.
 - .3 Valves.

1.5 MAINTENANCE DATA

- .1 Division 01 – Closeout Submittals

1.6 OCCUPANCY DOCUMENTATION

- .1 The Contractor shall submit the following documentation to the Departmental Representative a minimum of five (5) working days prior to the project occupancy site walk-through or occupancy date, whichever is scheduled first. The dates will be established by the Departmental Representative. It is the contractor's responsibility to provide all documentation to the Departmental Representative in a timely manner. If all documentation is not received, the Departmental Representative may not be able to issue the associated Schedule C-B in support of the building occupancy application and any associated consequences shall become the responsibility of the contractor.

- .2 Copies of pressure test reports for all piping systems on Contractor's letterhead.
- .3 Chlorination certificates for potable water systems.
- .4 Plumbing inspector's final certificate.

1.7 TEMPORARY USAGE OF PLUMBING EQUIPMENT

- .1 Plumbing equipment and systems shall not be used without the written permission of the Design Authority and in no circumstances shall be used prior to testing and inspection.

1.8 OTHER CONTRACTS ON THIS SITE

- .1 These documents include work that will require connection of piping systems to piping already provided under another contract prior to the construction completion of the piping systems described in this set of documents.
- .2 Cooperation with respect to on-site coordination of all piping connections is an integral part of the responsibility of this section of the work all within the basic tender price. No extra cost will be allowed based on a failure to allow for scheduling of piping connections to produce a complete workable system whether shown on the drawings or not.
- .3 Special coordination will need to be carried out with respect to connecting to capped plumbing system services provided under a separate contract. Obtain these services drawings to coordinate branch piping installations on the floats with respect to pedestal placement.

1.9 EXISTING SERVICES

- .1 Protect all existing services encountered. Every effort has been made to show the known existing services. However, the removal of concealing surfaces may reveal other existing services. Work with the facility to trace the originating source and points served. Obtain instructions from the Departmental Representative when existing services require relocation or modifications, other than those already indicated in the Contract Documents.
- .2 Arrange work to avoid shutdowns of existing services. Where shutdowns are unavoidable, obtain Departmental Representative's approval of the timing, and work to minimize any interruptions.
- .3 In order to maintain existing services in operation, temporary relocations and/or bypasses of piping may be required.
- .4 Be responsible for any damages to existing system by this work.
- .5 The Departmental Representative reserves the right to withhold permission for a reasonable period with respect to any shutdown, if the shutting off of a service will interfere with important operations.

Part 2 Products

2.1 PRODUCT CONSISTENCY

- .1 All products utilized on the project shall be as per the shop drawing submissions.

- .2 All products of a similar nature, used in a similar system or application shall be of the same manufacturer throughout the project.

2.2 MISCELLANEOUS METAL RELATED TO PLUMBING SYSTEMS

- .1 Frames shall be of welded construction consisting of angle iron sections with 7.9mm locating strips and anchoring lugs at a minimum of 900mm centres.
- .2 Coverplates shall be constructed of minimum 7.9mm checker plate in sections not exceeding 0.93 square metres in size with lifting holes at each end of each section. Coverplates shall be provided complete with at least two (2) lifting keys.

Part 3 Execution

3.1 PIPING INSTALLATION

- .1 General
 - .1 Use standard fittings for direction changes. Provide drain petcocks as required.
 - .2 Where pipe size differs from connection size to equipment, install reducing fitting close to equipment. Reducing bushings are not permitted.
 - .3 Install flanges or unions to permit removal of equipment without disturbing piping systems.
 - .4 Clean ends of pipes or tubing and recesses of fittings to be jointed. Assemble joints without binding.
 - .5 Install piping to connections for float pedestals.
 - .6 Plug or cap pipe and fittings to keep out debris during construction.
 - .7 Jointing of pipe shall be compatible with type of pipe used.
 - .8 Non-corrosive lubricant or Teflon tape shall be applied to the male thread of threaded joints.
 - .9 Flush and clean out piping systems after testing.
- .2 Equipment Drainage
 - .1 Install drain valves at low points.
- .3 Install pressure piping with loops and offsets which will permit expansion and contraction to occur without damaging the pressure piping system.

3.2 MISCELLANEOUS METALS RELATING TO PLUMBING SYSTEMS

- .1 All miscellaneous metal related to the plumbing systems including all steel covers or cages to protect exposed piping subject to mechanical damage is part of this section of the work.
- .2 Prime coat after fabrication with two coats of red primer.
- .3 See separate division of specification for finish painting requirements.

3.3 PIPING EXPANSION

- .1 All piping systems, including all take-offs shall be so installed that the piping and connected equipment will not be distorted by expansion, contraction or settling.

- .2 If circumstances on the job require additional changes in direction from those shown on the drawings, the configuration shall be adjusted to suit at no extra cost.
- .3 Anchors shall be installed where necessary to control expansion.

3.4 TESTING AND INSPECTION

- .1 Furnish all labour, materials, instruments, etc. necessary for all required tests. All work shall be subject to inspection by local plumbing inspector and review by the Departmental Representative. At least (48) business hours' notice shall be given in advance of making the required tests for projects.
- .2 All leaks shall be corrected by remaking the joints. The systems shall be retested until no leaks are observed.

3.5 PROJECT PHOTOGRAPHS

- .1 The Contractor shall provide digital photographs in "jpeg" format to the Departmental Representative complete with a text description for each photograph including the date, system type, materials used, and location/direction. Submit the photographs via email and/or disc as requested by the Departmental Representative.
- .2 Provide additional digital photographs of the work as requested by the Departmental Representative to assist in the resolution of RFI's, prior to covering the work.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 SCOPE OF WORK

- .1 Domestic water connections to float pedestal hose bibbs.
- .2 New domestic water piping shall be connected to receive domestic water supply from the existing domestic water piping as depicted on the drawings.

Part 2 Products

2.1 PIPE AND FITTINGS

- .1 Above ground water pipe:
 - .1 Polyvinyl chloride (PVC) Schedule 80 pressure pipe to CSA B137.3 with socket fittings to ASTM D2466/D2467.

2.2 VALVES

- .1 Ball and Waste: (for pedestal isolation and drain-down)
 - .1 25mm and smaller, 2-Piece, full port, ball and waste lead free copper silicon alloy ball valves with side drain port to drain or vent downstream line when the valve is in the off position, blow-out proof stem, lever handle operator, PTFE seats and full port, minimum 1035 kPa rating.

Part 3 Execution

3.1 SUPPLY PIPING

- .1 Clean pipes, fittings, valves, and appurtenances of accumulated debris and water before installation.
- .2 Support pipes to manufacturer's standard instructions and specifications.
- .3 Join pipes in accordance with manufacturer's standard instructions and specifications.
- .4 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .5 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
 - .1 Whenever work is stopped, install a removable watertight cap at open end of last pipe to prevent entry of foreign materials.
- .6 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

3.2 VALVE INSTALLATION

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Ball and Waste Valves
 - .1 Install shut-off or isolation valves whether shown on the drawings or not at the following locations:
 - .1 At each float pedestal.
 - .2 At all points as indicated on the drawings.
 - .3 At all points where the plumbing code requires same.

3.3 TESTING AND INSPECTION

- .1 Testing shall consist of hydraulic pressure testing at 1400 kPa for eight (8) hours.
- .2 Submit signed and dated pressure test reports for all sections of the water distribution systems.

3.4 FLUSHING AND CHLORINATION OF WATER LINES

- .1 Thoroughly flush all water piping so that it is free from scale, sediment and debris as soon as possible after the system is filled with water.
- .2 On completion of installation and testing, all water piping shall be pre-flushed, chlorinated and flushed again in accordance with AWWA C-601.
- .3 On projects with water piping being connected to the existing water distribution system including system piping modifications, piping extensions, etc., flushing and chlorination of all new piping remains a requirement. Provide all required isolation, fill and drain valves required to flush and chlorinate the new piping without impacting the existing system piping.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 This section covers items common to sections of Division 26. This section supplements requirements of Division 1.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.1-15, Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations latest version.
 - .2 CAN/CSA-C22.2 No. 0-10 (R2015), General requirements-Canadian electrical code, part II latest version.
 - .3 CAN/CSA-C22.3 No. 1-01(Update March 2005), Overhead Systems.
 - .4 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 Grey 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-C235-83.
- .2 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.
- .3 Language operating requirements: provide identification nameplates for control items in English.

1.5 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Detailed work schedules clearly indicating all the shutdown time.
- .3 Product Data: submit WHMIS MSDS in accordance with Section 01 35 33 – Health and Safety.

- .4 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 coordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 If changes are required, notify Departmental Representative of these changes before they are made.
- .5 Quality Control: in accordance with Section 01 45 00 – Quality Control.
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 – LOAD BALANCE.
- .6 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 – FIELD QUALITY CONTROL.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.
- .2 Qualifications: Electrical work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with Authorities Having Jurisdiction 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.
- .3 Site Meetings:
 - .1 Site Meetings: as part of Manufacturer's Field Services described in Part 3 – FIELD QUALITY CONTROL, schedule site visits to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins;

- .2 At bi-monthly intervals for the duration of the project;
- .3 Upon completion of Work after cleaning is carried out.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 – Health and Safety.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within two (2) weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

1.8 SYSTEM STARTUP

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

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 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Division 1 – Sustainable Requirements: Construction.
- .2 Do verification requirements in accordance with Section 01 45 00 – Quality Control.

2.2 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 is not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and coordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 05 21 – Wires and Cables (0-1000 V).

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Departmental Representative.
- .2 Porcelain enamel decal signs, minimum size 175mm x 250mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
 - .1 Nameplates: Lamacoid 3mm thick plastic engraving sheet. For normal power, black face, white lettering. Lettering accurately aligned and engraved into core mechanically attached with self-tapping screws. For emergency power, the same Lamacoid label, only red face and white lettering.
 - .2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50mm	1 line	3mm high letters
Size 2	12 x 70mm	1 line	5mm high letters
Size 3	12 x 70mm	2 lines	3mm high letters
Size 4	20 x 90mm	1 line	8mm high letters

NAMEPLATE SIZES

Size 5	20 x 90mm	2 lines	5mm high letters
Size 6	25 x 100mm	1 line	12mm high letters
Size 7	25 x 100mm	2 lines	6mm high letters

- .2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
- .3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of 25 letters per nameplate.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and voltage characteristics.
- .6 Identify equipment with size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

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

2.8 CONDUIT AND CABLE IDENTIFICATION

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

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency	Red	Blue
Other Security Systems	Red	Yellow

2.9 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.

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.

3.2 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: rigid galvanized conduit, sized for free passage of conduit, and protruding 50mm.
- .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 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes, and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.5 MOUNTING HEIGHTS (WHERE APPLICABLE)

- .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 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400mm.
 - .2 Wall receptacles:
 - .1 General: 300mm.
 - .2 Above top of continuous baseboard heater: 200mm.
 - .3 Above top of counters or counter splash backs: 175mm.
 - .4 In mechanical rooms: 1400mm.
 - .3 Panelboards: as required by Code or as indicated.

3.6 COORDINATION OF PROTECTIVE DEVICES

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

3.7 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 – Quality Control.
 - .1 Power distribution system including phasing (phase rotation), voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system and communications.
 - .6 Insulation resistance (IR) testing:
 - .1 Megger circuits, feeders and equipment up to 350V with a 500V instrument.
 - .2 Megger 350-600V circuits, feeders and equipment with a 1000V instrument.
 - .3 Check resistance to ground before energizing.
 - .4 Other testing as defined in other sections of the contract documents.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

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

3.8 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 SECTION INCLUDES

- .1 General requirements related to existing buildings.

1.2 RELATED SECTIONS

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

1.3 SEQUENCING, PHASING AND SCHEDULING OF WORK

- .1 Refer to Section 26 05 10 – Electrical Demolition and ensure that all work on existing facilities, services and utilities is coordinated, sequenced, phased, and scheduled with all other work as directed by the marine contractor. Refer to other specification sections for phasing and scheduling.

1.4 EXISTING CONDITIONS

- .1 Examine the site and existing conditions prior to tendering on this work and make due allowance for these conditions in the tender. Confirm all locations and routings of any existing services, above and below grade, which might be affected by this installation and allow for all costs in the tender.
- .2 Indication on the drawings of existing conduit, outlets and other electrical apparatus is based on casual field observations and records of past contracts. As such, this information represents the best data available but is not guaranteed to be complete or accurate. Verify that field measurements and circuiting diagrams as indicated on drawings and that abandoned wiring and equipment serve only abandoned facilities. Report discrepancies to Departmental Representative before altering the existing conditions. Confirm existing circuiting on site, disregard circuiting shown on demolition drawings, unless verified by the Contractor.
- .3 Submission of a tender for this work shall indicate that the Contractor has made a complete examination of the site and has accepted the existing conditions.
- .4 Where alterations and/ or additions to existing equipment and/ or apparatus are required to be made by the contract documents, it shall be assumed that any existing CSA equipment certification may become invalid. Ensure that all changes are made in accordance with the current edition of the Canadian Electrical Code, Part 1, and where necessary obtain recertification, and include recertification costs in the tender.
- .5 No interruptions to the power, lighting, fire alarm, telecom, security or other ancillary systems on the facility site during normal working hours or after hours are to occur without notification being provided to the Departmental Representative. Advise the Departmental Representative in writing of any intended interruptions during or after the operating normal hours of the facility, include the proposed time and expected duration of the outage. Obtain permission from the Departmental Representative at a minimum of seventy-two (72) hours prior to partially or completely disabling any of the referenced systems. The Departmental Representative may cancel such permission in the event of an emergency or due to any facility requirement up to the time of the outage. The Contractor shall comply with full

- understanding of the facility cancellation request or conditions and shall not request penalties or costs. The Contractor may be required to work evenings and weekends as required to maintain operations at the facility and shall not request penalties or costs.
- .6 Assume full responsibility for any disruption or damages to existing services and systems during a shutdown. Provide all necessary material and equipment and provide all labour any temporary connections required to maintain the existing services during work on the existing systems. Include the provision and removal of such temporary connections for said work in the tender submission.
 - .7 Provide new breakers and cabling for all additional circuits as required. Update and retype source panel schedules. Where existing panels are modified by the scope of work, provide all the necessary blank covers and filler pieces. Under **NO** circumstances shall breaker spaces be left open.
 - .8 All systems such as power, lighting, fire alarm, telecom, security or other ancillary systems shall be fully operational during renovation and after renovation and shall be left to the satisfaction of the facility operators and the Departmental Representative.
 - .9 Contractor shall remove all abandoned, disused and surplus electrical equipment, devices, wiring, conduit, etc. from the areas of demolition and renovation areas and return reusable equipment to the Departmental Representative unless otherwise instructed.
 - .10 Contractor shall relocate, reroute and/ or rewire all wiring which passes through renovated areas, or is on the same circuit as the existing device to be removed, to maintain continuity and proper operation, typical for all power, lighting, fire alarm, telecom, security or other ancillary systems. Provide blank covers on all removed devices boxes where required.
 - .11 All equipment shown in grey and denoted existing and shall remain in its present location. Unless otherwise noted the equipment shall be relocated. Extend wiring, conduit and retest as required to facilitate the revised location.
 - .12 Contractor shall allow for adequate removal (without damage) of all reused fixtures, wiring devices, cabling, etc., to facilitate the renovation.
 - .13 Any fixtures, wiring devices, etc., expected to be reused and have been damaged during and/ or after their removal shall be replaced with new, approved, equipment or devices at the Contractor's cost. No additional costs will be charged to the contract.
 - .14 Contractor is responsible for adequate protection of the existing facility equipment, etc., in the areas of work, during the execution of the work.
 - .15 Contractor is responsible for cleaning up working area each day before leaving the renovation/ work area(s).
 - .16 Allow for one (1) fire alarm system device(s) verification dictated by the phasing and scheduling of the work, upon completion and prior to Substantial Performance.

1.5 INSTALLATION

- .1 Examine drawings of all other trades and allow for all work such as the removal, temporary relocation, and re-installation of electrical fixtures, equipment, devices, wiring, etc., where such work is required due to alterations in or around the existing facility at the area(s) of renovation.

- .2 Where the work requires modification, extension, etc., to power, lighting, fire alarm, telecom, security or other ancillary systems within the existing facility at the area(s) of renovation, all new conduit and wiring required for the work shall be buried/ concealed wherever possible. In certain cases (e.g. where it is necessary to clear permanent obstructions, or to avoid damage to the existing structures), concealed wiring may not be possible. In such cases, exposed installations are to use the appropriate material and methods to provide adequate mechanical protection and shall only be installed with a review and approval from the Departmental Representative.
- .3 Cut, chisel and patch concrete for conduits in the area(s) of renovation as required.
- .4 Remove all disused and abandoned wiring to source supply. Remove all exposed and abandoned conduit, as required.
- .5 Disconnect abandoned outlets and remove devices. Remove abandoned outlets when supply conduit is abandoned and removed. Blank-off all disused outlet boxes that cannot be removed.
- .6 Disconnect, remove and dispose of abandoned panelboards and distribution equipment that the Departmental Representative has deemed not salvageable.
- .7 Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- .8 Clean and repair existing materials and equipment which remain or are to be reused, as described elsewhere in these specifications.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 61 00 – Product Requirements.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 In accordance with Section 01 74 19 – Waste Management and Disposal.

1.4 SCOPE

- .1 The Contractor shall understand that the demolition and construction will be performed in an operating environment that is normally occupied during the day. Maintain electrical and communication systems in areas not under renovation or construction as required to minimize services disruption.
- .2 The contract documents do not show all existing equipment, appurtenances, conduit, boxes or wire. Conduit routing and wire grouping is not known. During demolition, the Contractor shall de-energize/ de-activate all existing electrical and communication systems affected in such a manner that complete systems are not de-activated and joint/ shared services can be reactivated immediately on a temporary or permanent basis as site conditions and the construction dictate.
- .3 Any discrepancies appearing on the drawings or in this specification are to be brought to the attention of the Departmental Representative, who will then provide further direction.

1.5 SCHEDULING

- .1 Refer to Division 1.

1.6 EXAMINATION

- .1 Refer to Division 1.

1.7 PHASING

- .1 The demolition of the existing timber floats and the construction of the new timber and concrete floats shall be performed in multiple phases/ stages to minimize the disruption of operations at the facility. However, additional phases/ stages may be required to suit the overall construction plan of the Marine Contractor (or Prime Contractor). The Contractor shall submit an initial construction schedule with the tender submission outlining the proposed stages and phasing of the Work and any shutdown times associated to complete the Work. The Contractor shall allow for all the Work described herein and shown on the drawings. No additional costs will be provided as a result of the work phasing. The Contractor shall submit a detailed work plan for review prior to commencing with the Work (the detailed work plan shall be in addition to the initial plan). It is the sole

responsibility of the Contractor to coordinate all the material delivery and propose a delivery and installation schedule that reflects any supplier(s) anticipated lead time(s).

- .2 The following is a **suggested** guideline of stages/ phases for the electrical work:
 - .1 Phase 1, Stages 1-5: Trench, excavate, install conduits pullboxes and feeders from the existing supply sources originating at either existing Substation 3, 4, 5 or 6 to the various locations adjacent the new gangways for Floats 'A', 'B1', 'B2', 'C' & 'D'.
 - .2 Phase 1, Stages 6-10: Pull new feeder cabling with adequate slack for coiling within new pullboxes; Install concrete pads or concrete pedestals for all new outdoor CDP distribution panels; Connect existing (de-energized) sources to the new CDP distribution panels.
 - .3 Phase 2, Stages 11-14: Under the direction of the marine General Contractor, identify & de-energize the existing Jetty & MF float power pedestals for the existing Floats 'A', 'B1', 'C' & 'D'; Disconnect and remove all existing, end-of-life float power pedestals; Remove, clean, test and safely inventory the existing pedestal, post-mounted LED luminaire heads that are to be reused.
 - .4 Phase 2, Stages 15-18: Remove entirely all existing disused feeders from their existing source supplies to the decommissioned float power pedestals for Float 'A', 'B1', 'C' & 'D'; Remove all existing disused pullboxes and appurtenances; Patch and make repairs as required to all areas of demolition.
 - .5 Phase 3, Stages 19-23: Upon completion, mooring and final connections of any given new timber or concrete float and only under the direction of the marine General Contractor, install the conduits and feeders for the new float power pedestals, along the float and gangways and terminate in pull boxes adjacent to the new outdoor CDP distribution panels.
 - .6 Phase 3, Stages 24-28: Perform all splicing of the supply feeders to the branch feeders at the new pullboxes and outdoor CDP distribution panels; Perform all final connections to the new power pedestals on the new floats; Perform cable & continuity tests, as required prior to energization.
 - .7 Phase 3, Stages 29-32: Connect, test & sequentially energize the new outdoor CDP distribution panels from their respective supply sources originating from either existing Substation 3, 4, 5 or 6; Install all reused LED luminaires on new low-height (2.5m) galvanized posts, located on the new floats and connect to the nearest float power pedestal.
- .3 This guideline shall **NOT** be interpreted as the detailed Work Plan. It shall remain the responsibility of the Contractor(s) to provide a comprehensive plan for the electrical and mechanical work associated with the demolition and new construction of the timber and concrete float(s). Any proposed plan shall consider the requirement to minimize the out-of-service and facility shutdown times and avoid any extended periods of interruption.
- .4 Float 'C' must **NOT** be out-of-service for longer than fourteen (14) days, or two (2) weeks. Contractor shall make all the necessary contingents, site preparations and equipment provisions with regard to demolition and replacement installations, so as to be completed within this period of time. Either Floats 'A', 'B' or 'Float 'D' must be available for service

during this time. No more than two (2) floats are to be taken out-of-service at any time. Contractor shall coordinate all work with the Marine Contractor (Site General or Prime Contractor), as required to complete this work. Scheduling of the replacement float(s) construction will be as per the Master Construction Schedule prepared by the Marine Contractor (or Site General or Prime Contractor).

1.8 PROTECTION

- .1 Refer to Division 1.

Part 2 Products

2.1 STANDARDS

- .1 Refer to applicable material standards in other specification sections and/or as detailed on drawings.

Part 3 Execution

3.1 DEMOLITION

- .1 The demolition shall be carried out in strict conformance with provincial, local and municipal authority guidelines and Part 8 of the B.C. Building Code, current edition. The Contractor shall be responsible for demolition and removal of all existing electrical systems where shown. Include all labor, materials, equipment and services necessary and incidental to complete all the demolition and removal of all related electrical installations where identified in the contract documents.
- .2 Redundant, faulty or disused electrical components in the areas of demolition excluding those specifically identified in the following clauses shall become the property of the Contractor for disposal and shall be removed from site.
- .3 Large electrical components which are to be demolished by the Contractor are to be reviewed with the Departmental Representative. Where the equipment is deemed to be retained and stored, the equipment will be suitably cleaned and best packaged and turned over to the Departmental Representative at a designated location established on the site. If the Departmental Representative deems the equipment is to be disposed, these items will become property of the Contractor for disposal or recycling and are to be removed from site.
- .4 The demolition drawings do not necessarily indicate all the conditions, details or work required. Prior to the demolition, the Contractor shall examine the site to determine the actual conditions and the extent of the work. Any details or information that may not be clear shall be submitted to the Departmental Representative for further review. Any questions as to which systems are to be removed versus which systems are to remain shall be submitted to the Departmental Representative for clarification prior to commencing with demolition work.
- .5 The demolition work shall be a phased and shall comply with the construction schedule. The Contractor shall submit a schedule of demolition work fourteen (14) days prior to

commencement of work. The Contractor shall not proceed with the work until receiving approval from Departmental Representative.

- .6 Contractor shall remove existing systems, shown or specified, necessary or reasonably inferred, for completion of their work. All demolition waste and materials removed will become the property of the Contractor, or be removed from the premises and legally disposed off-site in accordance with instruction defined in other sections of this specification.
- .7 The Contractor shall dispose of hazardous materials in accordance with all local, provincial, and federal regulations, refer to other sections
- .8 After completing demolition work, inspect all exposed finishes and repair damaged finishes including roadway surfaces and asphalt paving.

3.2 DISRUPTION TO OPERATIONS

- .1 The Contractor shall provide detailed work schedule indicating the shutdown time.
- .2 Do not disconnect the equipment if the replacements (new parts) are not arrived onsite to minimize the shutdown time.
- .3 Provide the new trenching, conduits, pull the cables and prepare the work for the distribution panels and the power pedestals before disconnecting to minimize the changeover period. Do **NOT** re-use the existing cables, provide new wiring and raceways as described herein and shown on the drawings.
- .4 The Contractor shall be responsible for coordinating the demolition of all affected electrical systems to prevent disruption to the facility and minimize downtime.
- .5 The Contractor shall be responsible for coordinating the demolition by other divisions of the specifications (including de-construct electrical services, make-safe, etc.) to prevent disruption to the facility and minimize downtime.
- .6 Contractor shall coordinate scheduled changeover and shutdown times with the Departmental Representative and other divisions and coordinate the installation of the new equipment. All equipment installed and modified shall require testing before start-up.
- .7 Contractor shall provide temporary connections to all required equipment for temporary power during the installation of any new equipment.
- .8 The Contractor shall include all temporary connections necessary to permit the Departmental Representative or facility users to occupy areas of the site during the various construction phases.

3.3 REUSE OF EXISTING COMPONENTS

- .1 Existing components may be reused only where so specifically indicated on the drawings or within these specifications. However, in all cases all wiring shall be new and no splicing shall be permitted at any location unless specifically indicated or where permitted by code.
- .2 Existing luminaires that are intended for reuse will be thoroughly cleaned and tested prior to reassembly on new structures.

3.4 DISTRIBUTION OF CIRCUITS

- .1 Circuit: power, lighting, telecom, and existing ancillary systems which are disrupted during demolition and are essential, are to be made good immediately. The Contractor shall identify these circuits to the Departmental Representative. Specific tasks involving the demolition of essential circuits will require that the Contractor obtain permission from the Departmental Representative before proceeding.
- .2 Provide a fire watch where the fire alarm system will not be operational for an extended period, due to the new work.

3.5 ABANDONED CONDUIT, WIRE AND EXISTING CIRCUITS

- .1 All abandoned conduit and wire to be removed and disposed of by the Contractors. Where indicated on the drawings to maintain existing conduits, provide a pull string and cap both ends of the conduits and mark on the record drawings as a spare.
- .2 Remove all accessible (e.g. surface) wiring and cabling back to source. Remove abandoned outlets and raceways.

3.6 EXCAVATION AND CUTTING DAMAGE

- .1 Circuits that are disrupted by cutting or drilling (i.e. buried or concealed conduits and cables) to be brought to the attention of the Departmental Representative. Obvious systems disturbed because due care and attention was not followed, shall be repaired immediately at no additional cost to the contract.
- .2 All trenching and underground work shall be supervised and monitored as described in Divisions 1, 31, and 33.

3.7 FIRE ALARM SYSTEM

- .1 Construction/ demolition activities in the work areas may require that fire alarm system manual and enunciation devices are protected from construction damage, etc. Coordinate with the Departmental Representative as required to protect components of the fire alarm system to prevent nuisance operation and alarms.
- .2 Maintain the existing fire alarm system in areas under construction as required. Relocate, rewire and provide interim connections if required. Provide temporary fire alarm initiation and signal devices to suit any temporary exiting provisions.
- .3 Contractor to confirm with the Departmental Representative at the start and the end of each working day to ensure the operation of the existing fire alarm system in the areas of work.
- .4 The existing fire alarm system is to remain fully operational in the areas of construction when the Contractor is either on site, or after the Contractors normal work hours (i.e. overnight, holidays, and weekends).

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

- .1 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2No.65-93 (R1999), Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Engineer.

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for stranded copper conductors.
 - .3 Clamp for stranded aluminum conductors.
 - .4 Stud clamp bolts.
 - .5 Bolts for copper conductors.

- .6 Bolts for aluminum conductors.
- .7 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, aluminum-sheathed cable, mineral-insulated cable, flexible conduit, and non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 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.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

- .1 CSA C22.2 No.0.3-96, Test Method for Electrical Wires and Cables.
- .2 CAN/CSA C22.2 No.131-M89 (R1994), Type TECK 90 Cable.

1.3 PRODUCT DATA

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG, copper.
- .2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 or RWU90 Jacketed.
- .3 Neutral supported cable: 3-phase insulated conductors of copper and one (1) neutral conductor of copper or steel reinforced, size as indicated.

2.2 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: copper as indicated.
 - .2 Circuit conductors: copper as indicated, size as indicated.
- .3 Insulation: Chemically cross-linked thermosetting polyethylene rated type RW90XLPE, 600V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: flat galvanized steel
- .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 50mm and smaller. Two-hole steel straps for cables larger than 50mm.
 - .2 Channel type supports for two (2) or more cables.
 - .3 Threaded rods: 6mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight, explosion-proof approved for TECK cable (this is a site specific direction to suit the exposed marine environment).

2.3 ARMOURED CABLES (WHERE APPLICABLE)

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90, 600V XLPE RW90.
- .3 Armour: interlocking type fabricated from galvanized steel strip.
- .4 Connectors: anti-short connectors.
- .5 Only to be used in areas where reviewed by the Departmental Representative.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local Authority Having Jurisdiction over the installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 – Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 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.
- .6 Branch circuit wiring for surge suppression receptacles to be 2-wire circuits only, i.e. common neutrals not permitted.
- .7 Provide numbered wire collars for telecom wiring. Numbers to correspond to record drawings. Obtain wiring diagram for telecom wiring.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings, and Conduit Fittings.
 - .2 Perform insulation resistance testing on all cable and wiring, submit results to the department representative.
 - .3 Perform continuity test on all new cable and wiring; submit results to the department representative.
 - .4 Check each conductor tested for unintentional grounds.
 - .5 Check if wire and cable are properly tightened to manufacturer's recommendations.
- .2 Install straps, clamps and box connectors to cables as required.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Section 26 05 00 – Common Work Results for Electrical.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837-1989 (R1996), Qualifying Permanent Connections Used in Substation Grounding.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as indicated as required to electrically conductive system ground at the existing substations.
- .2 Copper conductor: minimum 6m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.
- .3 Rod electrodes: copper clad steel 19mm dia by 3m long (preferred).
- .4 Plate electrodes: copper, surface area 0.2m², 1.6mm thick (acceptable, to suit soil/ ground conditions).
- .5 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .6 Insulated grounding conductors: green.
- .7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

- .8 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 or Hypress connectors, both installed with rubberized heat-shrink insulator boot over the connection.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .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 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.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .13 Ground secondary service pedestals, run ground conductor to the source panel and existing substation ground.

3.2 MANHOLES

- .1 Install conveniently located grounding stud, electrode, size #6 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.

3.3 ELECTRODES

- .1 Make ground connections to continuously conductive underground metal water pipe when a substation ground is not available.
- .2 Install water meter shunt, where required.
- .3 Install concrete encased electrodes in building foundation footings & concrete duct banks, with terminals connected to grounding system, as required.
- .4 Install rod electrodes or grounding plates and make permanent grounding connections.
- .5 Bond separate, multiple electrodes continuously.
- .6 Use size #4/0 AWG copper conductors for connections to electrodes or plates.
- .7 Make special provision for installing electrodes or plates that will give a resistance less than 5Ω to ground value where rock or sand terrain prevails. Ground as required by code.

3.4 EQUIPMENT GROUNDING

- .1 Install additional grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, central distribution panels, building steel work, panelboards, outdoor lighting & masts and power pedestals.

3.5 GROUNDING BUS

- .1 Install additional grounding bus bar assembly, mounted on insulated supports in substation(s) enclosure, where required.

3.6 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with facility requirements.
 - .2 Fire alarm, intercommunication systems, where required.

3.7 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and the local Authority Having Jurisdiction over the work site.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during testing.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Consultant.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 U-shape, size 41mm x 41mm, 2.5mm thick, suspended set in poured concrete walls and ceilings.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .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. (Where Applicable.)
- .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 50mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6mm dia threaded rods and spring clips.

- .2 Support two (2) or more cables or conduits on channels supported by 6mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .12 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 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 – Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25mm minimum extension all around, for flush-mounted pull and junction boxes.
- .3 Weather-proof and corrosion resistant junction and pull box
 - .1 For damp/wet locations including utility tunnel and as indicated.
 - .2 To be rated and certified for Type 4X to CAN/CSA-C22.2 NO. 94.1 or CAN/CSA-C22.2 NO. 94.2 as applicable.
 - .3 Stainless steel construction.
 - .4 Hinged door complete with seal, keyed latch and catch.

2.2 CABINETS

- .1 CSA Type 3R: sheet steel, hinged door and return flange overlapping sides, gasketed, SS handle, lock and catch, for exposed, surface mounting.
- .2 CSA Type 1: sheet steel cabinet, with hinged door, latch, lock, two (2) keys, containing backplane for mounting of devices.

Part 3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in accessible locations.
- .2 Mount cabinets with top not higher than 2m above finished floor.
- .3 Install terminal block where indicated in Type 1 cabinets.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30m of conduit run between pull boxes.

3.2 IDENTIFICATION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.1-1998, Canadian Electrical Code, Part 1.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 Min. 102mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Barriered 347V outlet boxes for 347V switching devices. (Where Applicable.)
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

- .1 Electro-galvanized steel single and multi-gang flush device boxes for flush installation, minimum size 76mm x 50mm x 38mm or as indicated. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required (where applicable).
- .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102mm x 54mm x 48 mm. (Where Applicable.)
- .3 102mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 102mm square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.
- .5 Cast FS aluminum boxes for exposed, exterior locations.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi-gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount cast in concrete with matching extension and plaster rings as required (where applicable).

2.5 CONDUIT BOXES/ BODIES

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring devices.

2.6 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of the Work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are **NOT** allowed.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings, and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 NO. 45.1-07 (R2012) Electrical Rigid Metal Conduit - Steel.
 - .3 CSA C22.2 NO. 45.2-08 Electrical rigid metal conduit - Aluminum, red brass, and stainless steel.
 - .4 CSA C22.2 NO. 56-13 Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .5 CSA C22.2 NO. 83-M1985(R2013) Electrical Metallic Tubing.
 - .6 CSA C22.2 NO. 211.1-06 (R2011) Rigid Types EB1 and DB2/ES2 PVC Conduit.
 - .7 CSA C22.2 NO. 211.2-06 (R2011) - Rigid PVC (Unplasticized) Conduit.
 - .8 CAN/CSA-C22.2 NO. 227.3-05 (R2010) - Non-metallic Mechanical Protection Tubing (NMPT).
 - .9 CSA C22.2 NO. 18.3-12 Conduit, tubing, and cable fittings.
 - .10 CAN/CSA C22.2 NO. 18.4-15 Hardware for the Support of Conduit, Tubing, and Cable.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction/ Demolition 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.

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 direct current applications (where applicable).

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel.
- .2 Rigid aluminum conduit for wharf utility tunnel &/ or surface mounted on floats, location as indicated on drawings:
 - .1 Aluminum threaded to CSA C22.2 No. 45.2.
- .3 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .4 Electrical Metallic Tubing (EMT): only where permitted by Departmental Representative.
 - .1 Conduit & formed connectors to CSA C22.2 No. 83.
- .5 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .6 Flexible metal conduit: to CSA C22.2 No. 56 liquid-tight flexible metal conduit.
- .7 Underground duct: to CSA-C22.2 No. 211.1.

2.3 CONDUIT FASTENINGS

- .1 To CAN/CSA-C22.2 No. 18.4.
- .2 One-hole steel straps to secure surface conduits 35mm and smaller.
 - .1 Two-hole steel straps for conduits larger than 35mm.
- .3 Beam clamps to secure conduits to exposed steel work.
- .4 Channel type supports for two or more conduits.
- .5 Threaded rods, 6mm 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 Provide factory "ells" where 90 degree bends for 25mm and larger conduits.
- .3 Watertight connectors and couplings for EMT (where permitted).
 - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Flexible and watertight expansion fittings with internal bonding jumper assembly.
 - .1 Suitable for 100mm linear expansion or suitable for expected structural expansion.
 - .2 Suitable for 19mm deflection or suitable for expected structural deflection.
- .2 Weatherproof expansion fittings for linear expansion at entry to panel.
- .3 Complete with standard tapered thread hub bushing to fit standard rigid conduit and inner sleeve to maintain constant inner diameter for smooth insulated wireway and protection of wire insulation.
- .4 Complete with watertight flexible corrosion resistant neoprene outer jacket and stainless steel jacket clamps.
- .5 Complete with tinned copper flexible braid grounding straps.

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 in unfinished areas.
- .3 Use rigid galvanized steel-threaded conduit except where specified otherwise.
- .4 Use epoxy-coated conduit underground in exposed, marine environment.
- .5 Wharf utility tunnel: use rigid aluminum threaded conduit.
- .6 Use electrical metallic tubing (EMT) except in cast concrete above 2.4m not subject to mechanical injury, only where permitted by Departmental Representative.
- .7 Use rigid PVC conduit underground in corrosive areas.
- .8 Use flexible metal conduit for connection to motors in dry areas, connection to surface or recessed fluorescent fixtures, and work in movable metal partitions.
- .9 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .10 Use explosion-proof flexible connections in exposed marine environments.
- .11 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .12 Minimum conduit size for lighting and power circuits.

- .13 Bend conduit cold
 - .1 Replace conduit if bent, kinked or flattened more than 1/10th of its original diameter.
- .14 Mechanically bend steel conduit over 19mm diameter.
- .15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .16 Install fish cord in empty conduits.
- .17 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .18 Dry out conduits before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75mm parallel to steam or hot water lines with minimum of 25mm 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 (except PVC) with heavy coat of bituminous paint.
- .3 Install green ground conductor for each underground conduit installation.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.1-2015 Canadian Electrical Code, Part 1.
- .2 CAN/CSA-C22.3 NO. 7-15 Underground systems.

1.2 RELATED WORK

- .1 Division 1.
- .2 Section 26 05 00 – Common Work Results for Electrical.
- .3 Section 26 05 21 – Wires and Cables (0-1000V).
- .4 Section 26 05 34 – Conduits, Conduit Fastenings, and Conduit Fittings.

1.3 ENVIRONMENTAL PROTECTION

- .1 Refer to Division 1.

1.4 ENVIRONMENTAL PROTECTION

- .1 Refer to Division 1.

Part 2 Products

- .1 Provide three (3) spare 5mm pulling rope in all new underground conduits when pulling conductors.

Part 3 Execution

3.1 INSTALLATION

- .1 Install cables as indicated in ducts. Refer to plan drawings for conduit system routing, pathways, and layouts.
- .2 Do not pull spliced cables in ducts.
- .3 Install multiple cables in ducts simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 Use specified rope to pull cables into ducts.
- .6 Before pull cables into ducts and until cables are properly terminated, seal end of cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct seal compound.
- .8 Provide pull string in all ducts for future use.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests of each type of cable and system as indicated.
- .2 Remove and replace entire length of cable if cable fails to meet any test criteria.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type power kiosks, power pedestals with or without panelboards and transformers.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .3 Section 26 05 00 – Common Work Results for Electrical.
- .4 Section 26 05 21 – Wire and Cables 0-1000V.
- .5 Section 26 12 16 – Dry Type Transformers up to 600V Primary.
- .6 Section 26 24 17 – Panelboards Breaker Type.
- .7 Section 26 27 26 – Wiring Devices.
- .8 Section 26 28 16 – Moulded Case Circuit Breakers.

1.3 REFERENCES

- .1 Equipment shall comply with Canadian standards association (CSA International):
 - .1 CSA C22.2 No.29-M1989 (R2000), Panelboards and Enclosed Panelboards.
 - .2 CSA-C22.2 No. 5-[02], Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).
 - .3 CSA C22.2 No.C9-M1981 (R2001), for Dry-Type Transformers.
 - .4 CSA C22.2 No.42 99 (R2002), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .5 CSA C22.2 No.42.1 00, Cover Plates for Flush Mounted Wiring Devices (Bi national standard, with UL 514D).
 - .6 CSA C22.2 No.55 M1986 (July 2001), Special Use Switches.
 - .7 CSA C22.2 No.111 00, General Use Snap Switches (Bi national standard, with UL 20, twelfth edition).
- .2 Equipment shall be tested and certified in accordance with Underwriters' Laboratories (UL):
 - .1 ANSI/ UL 231, entitled "Power Outlets".
 - .2 UL 50, entitled "Cabinets and Boxes".
 - .3 UL 67, entitled "Panelboards".
 - .4 UL 489, entitled "Moulded Case Circuit Breakers".
 - .5 UL 508A, entitled "Industrial Control Panels".
 - .6 UL 1062, entitled "Unit Substations".
 - .7 UL 1561, entitled "Dry Type General Purpose and Power Transformers".

- .8 NFPA 303 DTD 2012 entitled "Marinas and Boatyards".
 - .9 Overload capacity shall meet ANSI L57.96-01.250.
 - .10 Shall meet NFPA 70 (NEC), section 406.8 (B)(2)(a) 'A receptacle installed in a wet location shall be installed in a weatherproof enclosure, the integrity of which is not affected when the attachment plug cap is inserted.'
 - .11 If a laboratory other than UL is used, that laboratory must certify, in writing, that the power outlet has been tested and meets all of the requirements of ANSI/UL 231, including 746C "Polymeric Materials", and that the unit will pass the 94V0-5V flame test.
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A240 / A240M-15b, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Drawings to include electrical and fabrication details of panelboard branch breaker type, quantity, ampacity, transformer rating and enclosure materials and dimensions.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

Part 2 Products

2.1 FLOAT PEDESTALS

- .1 Main Housing
 - .1 The housing shall be constructed of 16-gauge, 316L low-carbon, stainless steel and shall be coated with UV-resistant polyurethane resin over a powder coating, 'white' in colour. Enclosure shall be CSA (NEMA) listed as a Type 3R, weatherproof/ all-weather enclosure. All final finishes and coatings are to be factory applied only.
 - .2 Maximum allowable dimensioning: to 356mm (W) x 356mm (D) x 1284mm (H). Maximum allowable weight: up to 53kg.

- .2 Lighting Assembly/ Housing
 - .1 The lighting top housing shall be constructed of 16 gauge, 316L low carbon stainless steel and shall be coated with UV-resistant polyurethane resin over a powder coating, 'white' in colour. It shall be UL listed as a type 3R weatherproof enclosure.
 - .2 Each pedestal shall be equipped with a non-metered LED light source that is controlled by an electromechanical photocell and protected by a 15 amp, single-pole breaker.
- .3 Loop Feed Busbar Assembly
 - .1 Units requiring wire feeds of differing voltages - Pedestals requiring wire feeds of differing voltages shall be equipped with a phase isolation plate. Two (2) separate access areas shall be provided with individual access panels separated internally by a phase isolation plate.
 - .2 STANDARD - 250 amp busbar - The bus system shall be of stud compression terminal type using a 3/8" silicon-bronze stud with a silicon-bronze Belleville type washer. The 3/8" silicon-bronze hex-nut shall be torqued to 150 inch-pounds with a maximum amperage rating of 250 amps.
 - .3 OPTIONAL – Single- and double-barrel mechanical busbars - rated for copper or aluminum - are also available in sizes ranging from #8 to 500MCM, refer to SLD.
- .4 Internal Wiring
 - .1 All load wiring shall be completed with 600 VAC RW90 XLPE insulated copper wire and shall be completely pre-wired at the factory to the load side of the compression lug assembly.
 - .2 All load copper wiring shall be of high stranding and tin plated to resist corrosion.
 - .3 The maximum size of the line wiring and lugging shall be AWG #350MCM direct feed or #4/0 loop feed
 - .4 This wire shall pass through a special moulded grommet assembly between the receptacle compartments, where applicable.
- .5 Grounding
 - .1 All exposed metallic parts must have an integral ground that is a part of the equipment grounding (bond) system. Hinged covers shall be complete with ground straps.
- .6 Electrical Component Mounting
 - .1 All electrical components shall be located at least 305mm above the mounting surfaces.
- .7 Panelboards
 - .1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer. Standard of acceptance: Cutler-Hammer Pow-R-Line series, combination panelboard. Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that the panel, including breakers, has been built to withstand.

- .3 Panelboards: 250V breakers rated for min. 10-18kA (symmetrical) interrupting capacity or as indicated, based on short-circuit calculation presented by contractor, bus rating for a min. of 22kA.
 - .4 Panelboards: enclosure rating to NEMA 3R.
 - .5 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.
 - .6 Panelboards: mains, number of circuits, and number and size of branch circuit breakers where indicated.
 - .7 Two (2) keys for each panelboard and key panelboards alike.
 - .8 Bus: Density rated copper bus with full size neutral.
 - .9 Mains: suitable for bolt-on breakers.
 - .10 Trim with concealed front bolts and hinges. Trim and doors to be full gasketed.
 - .11 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank filler for all spaces.
- .8 Circuit Breakers
- .1 Breakers: to Section 26 28 16 - Moulded Case Circuit Breakers. Bolt-on, moulded case, thermal magnetic circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 °C ambient and shall be UL/ULC listed.
 - .2 Common-trip breakers: with single handle for multi-pole applications.
 - .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .4 Circuit breaker ratings and interrupting capacity where shown. Otherwise, 347/600V circuit breakers to have min. of 18,000A IC symmetrical RMS interrupting capacity rating and 120/208V circuit breakers to have min. of 10,000A IC symmetrical RMS interrupting capacity rating. Exact rating to be adjusted upon completion of the short-circuit calculation without additional cost to the contract.
 - .5 Circuit breakers shall be located in panelboards, under lockable weatherproof doors.
 - .6 Circuit breakers for the 20 amp, 120 volt, straight blade receptacles and the 20 amp, 125 volt, twist-lock receptacles shall be single-pole, 20 amp.
 - .7 Circuit breakers for the 30 amp, 125 volt, twist-lock receptacles shall be single-pole, 30 amp.
 - .8 Circuit breakers for the 50 amp, 125 volt, twist-lock receptacles shall be single-pole, 50 amp.
 - .9 Circuit breakers for the 50 amp, 125/250 volt, twist-lock receptacles shall be two-pole, 50 amp.
 - .10 Circuit breakers for the 100 amp, 125/250 volt, pin-and-sleeve receptacles shall be two-pole, 100 amp.
 - .11 Circuit breakers for the 100 amp, 120/208 volt, pin-and-sleeve receptacles shall be three-pole, 100 amp.

- .12 Circuit breakers for the 60 amp, 480 volt, pin-and-sleeve receptacles shall be three-pole, 60 amp.
 - .13 Circuit breakers for the 100 amp, 480 volt, pin-and-sleeve receptacles shall be three-pole, 100 amp.
 - .14 Circuit breakers for the 100 amp, 277/480 volt, pin-and-sleeve receptacles shall be three-pole, 100 amp.
 - .15 Circuit breakers for the 200 amp, 480 volt, pin-and-sleeve receptacles shall be three-pole, 200 amp.
 - .16 Circuit breakers for the 200 amp, 600 volt, pin-and-sleeve receptacles shall be three-pole, 200 amp.
- .9 Receptacles
- .1 Twist-lock and straight blade GFI receptacles shall be mounted behind a lockable weatherproof, hinged door/ cover that is under tension to ensure proper closing pressure when the receptacle is or is not in use.
 - .2 All receptacles shall be mounted at least 610mm above the wharf.
 - .3 All receptacles under 60 amp shall be of the corrosion resistant type conforming to CSA L5 and/or CSA L6 requirements and are rated for marine use, where listed.
 - .4 All receptacle ratings under 30 amp shall be protected by a corresponding GFIC supply breaker.
 - .5 All receptacle ratings over 60 amp shall conform to IEC and CEE standards.
 - .6 All pin-and- sleeve receptacles shall be Cooper Crouse-Hinds ‘Arktite’ series (NO substitutions) required to match existing docking vessel requirements and shall have gasketed, spring-hinged, protective covers (NOT chained, screw-on caps).
 - .7 Refer to SLD for receptacle configuration requirements at each pedestal.
 - .8 20 amp, 125 volt, straight blade receptacles shall be GFI protected.
 - .9 20 amp, 125 volt, twist-lock receptacles shall be 2-pole, 3-wire (CSA L5-20R).
 - .10 30 amp, 125 volt, twist-lock receptacles shall be 2-pole, 3-wire (CSA L5-30R).
 - .11 50 amp, 125 volt, twist-lock receptacles shall be 2-pole, 3-wire.
 - .12 50 amp, 125/250 volt, twist-lock receptacles shall be 3-pole, 4-wire.
 - .13 60 amp, 480 volt, pin-and-sleeve receptacles shall be 3-pole, 4-wire.
 - .14 100 amp, 125/250 volt, pin-and-sleeve receptacles shall be 3-pole, 4-wire.
 - .15 100 amp, 120/208 volt, pin-and-sleeve receptacles shall be 4-pole, 5-wire.
 - .16 100 amp, 480 volt, pin-and-sleeve receptacles shall be 3-pole, 4-wire.
 - .17 100 amp, 277/480 volt, pin-and-sleeve receptacles shall be 4-pole, 5-wire.
 - .18 100 amp, 600 volt, pin-and-sleeve receptacles shall be 3-pole, 4-wire.
 - .19 200 amp, 600 volt, pin-and-sleeve receptacles shall be 3-pole, 4-wire.
- .10 Hose/ Cable Bracket
- .1 Each pedestal shall have aluminum brackets capable of holding a 17m length of 5/8" water hose or 17m of 50 amp, 4-conductor SOW rubberized cable.

- .11 Metering Provisions (Optional):
 - .1 120 ammeter - The kiosks shall be equipped with fully electronic meters that display the kilowatts used at each slip on a non-resettable digital counter that is protected from the weather. The accuracy of the meters must be certified by the manufacturer to have a 120 ampere rating and no more than a 2% error when tested in accordance with ANSI.-C12.1.
 - .2 200 ammeter - The kiosks shall be equipped with fully electronic meters that display the kilowatts used at each slip on a non-resettable digital counter that is protected from the weather. The accuracy of the meters must be certified by the manufacturer to have a 200 ampere rating and no more than a 2% error when tested in accordance with ANSI.-C12.1.
- .12 Communications
 - .1 Each pedestal shall be equipped with two (2) outlets for each slip. Each outlet shall contain a combination of RJ45 (data) outlets, RJ11 (telephone) outlets, or male coax (CATV) connectors under an injection-moulded heavy resin, weather protective cover.
 - .2 Each communication assembly shall include an internal isolation enclosure for the separation of high and low voltage equipment.
- .13 Water
 - .1 Each pedestal shall be equipped with single ¼ turn ball with a 3/4" NPT fitting hose bibb and stainless steel handle.
 - .2 The water assembly shall have an isolation box, which separates the water connections from the electrical compartment areas.
- .14 Standard of Acceptance
 - .1 Acceptable factory manufacturer for power pedestal distribution equipment:
EATON ‘Admiral-SS’ marine line
EATON – Marina Power & Energy
149 Warwick Court, Williamsburg, Virginia, 23185
Toll Free: 1-800-723-8009
 - .2 Where alternate manufacturers are being offered by the submitting proponents, within their tender submissions a full specification including: colour images, materials, finishes, arrangement drawing/ diagram, receptacle configuration, unit dimensioning and unit weight must be provide included for review and acceptance from the project stakeholders. Failure to comply will disqualify the proponents’ submissions.

2.2 UNIT SUBSTATIONS

- .1 Main Housing
 - .1 The enclosure housing shall be constructed of 14-gauge, 316L low-carbon, stainless steel and shall be coated with UV-resistant polyurethane resin over a powder coating, ‘white’ in colour. Enclosure shall be CSA (NEMA) listed as a Type 3R, weatherproof/ all-weather enclosure. All final finishes and coatings are to be factory applied.

- .2 The housing shall have a solar shield top to reduce heat transfer from the sun and to reduce the heat transfer from the transformer.
 - .3 Long-life thermostatically controlled fans shall be located such that the fans dissipate air from the transformer compartment.
 - .4 Long-life thermostatically controlled, static convection cabinet heaters shall be located in other compartments to mitigate cumulative moisture and condensation.
 - .5 Maximum allowable dimensioning: to 1816mm (W) x 915mm (D) x 1748mm (H), may vary with integral components. Maximum allowable weight: up to 1,280kg, depending on transformer size.
- .2 Doors
- .1 Integral stainless steel access doors, finished to the same as the enclosure/ housing, to each of the transformer and panelboard compartments and shall have key-entry, quarter turn, wing-nut of polished chromium nickel plating or stainless steel handles.
 - .2 The doors shall be sealed by 360° neoprene gaskets and be watertight. Provide door stiffeners as required to mitigate twisting of the door.
 - .3 The doors to the receptacle compartments shall have a cableway opening (min. 100mm x 200mm. T.B.C. with the shop drawing submission) at the door bottom with replaceable brush sweeps, provide a minimum of three (3) spare brushes for each opening.
- .3 Transformer
- .1 Transformers shall be wound with Class 'H', heavily insulated, copper bar and double-dipped in tough insulating varnish that protects the copper.
 - .2 The temperature rise of the transformer shall not exceed 150 °C.
 - .3 The insulation class for the transformer shall not exceed 220 °C per listed standards.
 - .4 Standard frequency shall be designed for 60-Hertz operation.
 - .5 Standard taps shall be FCAN (+2) and FCBN (-2) at 2.5% each.
 - .6 Standard primary voltage shall be 600V, 3-phase, Delta.
 - .7 Standard secondary voltages shall be: 277/480V, 3-phase, Wye; 120/208V, 3-phase, Wye or 120/240V, 1-phase.
 - .8 Standard primary circuit breaker protection shall be provided for the incoming feeds. Primary circuit protection may be removed where acceptable per the CEC and the Departmental Representative.
- .4 Internal Wiring
- .1 All secondary wire shall be completed with 600 VAC RW90 XLPE insulated copper wire and shall be completely pre-wired at the factory to the load side of the compression lug assembly.
 - .2 This wire shall pass through a special moulded grommet assembly between the transformer and the receptacle compartments.

- .5 Grounding
 - .1 All exposed metallic parts must have an integral ground that is a part of the equipment grounding (bond) system. Door and hinged covers shall be complete with ground straps.
- .6 Electrical Component Mounting
 - .1 All electrical components shall be located at least 305mm above the mounting surfaces.
- .7 Panelboards
 - .1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer. Standard of acceptance: Cutler-Hammer Pow-R-Line series, combination panelboard. Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that the panel, including breakers, has been built to withstand.
 - .3 Panelboards: 250V breakers rated for min. 10-18 kA (symmetrical) interrupting capacity or as indicated, based on short-circuit calculation presented by contractor, bus rating for a min. of 22 kA.
 - .4 Panelboards: enclosure rating to NEMA 3R.
 - .5 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.
 - .6 Panelboards: mains, number of circuits, and number and size of branch circuit breakers where indicated.
 - .7 Two (2) keys for each panelboard and key panelboards alike.
 - .8 Bus: Density rated copper bus with full size neutral.
 - .9 Mains: suitable for bolt-on breakers.
 - .10 Trim with concealed front bolts and hinges. Trim and doors to be full gasketed.
 - .11 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank filler for all spaces.
- .8 Circuit Breakers
 - .1 Breakers: to Section 26 28 16 - Moulded Case Circuit Breakers. Bolt-on, moulded case, thermal magnetic circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 °C ambient and shall be UL/ULC listed.
 - .2 Common-trip breakers: with single handle for multi-pole applications.
 - .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting, where applicable.
 - .4 Circuit breaker ratings and interrupting capacity where shown. Otherwise, 347/600V circuit breakers to have a minimum of 18,000A IC symmetrical RMS interrupting capacity rating and 120/208V circuit breakers to have a minimum of 10,000A IC symmetrical RMS interrupting capacity rating. Exact rating to be adjusted upon completion of the short-circuit calculation without additional cost to the contract.

- .5 Circuit breakers shall be located in panelboards, under lockable weatherproof doors.
- .9 Installation Equipment
 - .1 Two (2) heavy-duty stainless steel "C" channels shall be provided for easy mounting of the unit to the wharf.
 - .2 Removable louvred skirting shall be provided to cover the mounting area.
 - .3 Cable gland plates shall be provided on both the primary and secondary side of the unit base.
 - .4 Four (4) lifting eyes shall be provided with each unit, located on the top of the unit. These eye-bolts shall be stainless steel and shall be located under the solar shield.
- .10 Metering Provisions (Optional, Refer To SLD)
 - .1 120 ammeter - The kiosks shall be equipped with fully electronic meters that display the kilowatts used at each slip on a non-resettable digital counter that is protected from the weather. The accuracy of the meters must be certified by the manufacturer to have a 120 ampere rating and no more than a 2% error when tested in accordance with ANSI.-C12.1.
 - .2 200 ammeter - The kiosks shall be equipped with fully electronic meters that display the kilowatts used at each slip on a non-resettable digital counter that is protected from the weather. The accuracy of the meters must be certified by the manufacturer to have a 200 ampere rating and no more than a 2% error when tested in accordance with ANSI.-C12.1.
- .11 Ground Fault Monitoring
 - .1 Substation to be provided with an integral ground fault sensing and monitoring unit and shall be single-level (monitoring for a single main circuit breaker).
 - .2 WP indicator lights ('Red' - LED) shall be mounted and visible on the outside of the substation enclosure and shall illuminate when a ground fault condition occurs.
- .12 Standard of Acceptance
 - .1 Acceptable factory manufacturer for distribution equipment: EATON 'Unit Substation' marine line
EATON – Marina Power & Energy
149 Warwick Court, Williamsburg, Virginia, 23185
Toll Free: 1-800-723-8009
 - .2 Where alternate manufacturers are being offered by the submitting proponents, within their tender submissions a full specification including: colour images, materials, finishes, arrangement drawing/ diagram, receptacle configuration, unit dimensioning and unit weight must be provide included for review and acceptance from the project stakeholders. Failure to comply will disqualify the proponents' submissions.

2.3 PANELBOARDS

- .1 Main Housing
 - .1 The enclosure housing shall be constructed of 14-gauge, 316L low-carbon, stainless steel and shall be coated with UV-resistant polyurethane resin over a

- powder coating, 'white' in colour. Enclosure shall be CSA (NEMA) listed as a Type 3R, weatherproof/ all-weather enclosure. All final finishes and coatings are to be factory applied.
- .2 Long-life thermostatically controlled, static convection cabinet heaters shall be located in other compartments to mitigate cumulative moisture and condensation.
 - .3 Maximum allowable dimensioning: to 416mm (W) x 918mm (D) x 2286mm (H), may vary with integral components. Maximum allowable weight: up to 340kg.
- .2 Doors
- .1 Integral stainless steel access doors, finished to the same as the enclosure/ housing, to the panelboard compartment and shall have key-entry, quarter turn, wing-nut of polished chromium nickel plating or stainless steel handles.
 - .2 The doors shall be sealed by 360° neoprene gaskets and be watertight. Provide door stiffeners as required to mitigate twisting of the door.
- .3 Grounding
- .1 All exposed metallic parts must have an integral ground that is a part of the equipment grounding (bond) system. Door and hinged covers shall be complete with ground straps.
- .4 Electrical Component Mounting
- .1 All electrical components shall be located at least 305mm above the mounting surfaces.
- .5 Panelboards
- .1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer. Standard of acceptance: Cutler-Hammer Pow-R-Line series, combination panelboard. Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that the panel, including breakers, has been built to withstand.
 - .3 Panelboards: 250V breakers rated for a minimum 10-18 kA (symmetrical) interrupting capacity or as indicated, based on short-circuit calculation presented by contractor, bus rating for a minimum of 22 kA.
 - .4 Panelboards: enclosure rating to NEMA 3R.
 - .5 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.
 - .6 . Panelboards: mains, number of circuits, and number and size of branch circuit breakers where indicated.
 - .7 Two (2) keys for each panelboard and key panelboards alike.
 - .8 Bus: Density rated copper bus with full size neutral.
 - .9 Mains: suitable for bolt-on breakers.
 - .10 Trim with concealed front bolts and hinges. Trim and doors to be full gasketed.
 - .11 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank filler for all spaces.

- .6 Circuit Breakers
 - .1 Breakers: to Section 26 28 16 - Moulded Case Circuit Breakers. Bolt-on, moulded case, thermal magnetic circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 °C ambient and shall be UL/ULC listed.
 - .2 Common-trip breakers: with single handle for multi-pole applications.
 - .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting, where applicable.
 - .4 Circuit breaker ratings and interrupting capacity where shown. Otherwise, 347/600V circuit breakers to have a minimum of 18,000A IC symmetrical RMS interrupting capacity rating and 120/208V circuit breakers to have a minimum of 10,000A IC symmetrical RMS interrupting capacity rating. Exact rating to be adjusted upon completion of the short-circuit calculation without additional cost to the contract.
 - .5 Circuit breakers shall be located in panelboards, under lockable weatherproof doors.
- .7 Installation Equipment
 - .1 Two (2) heavy-duty stainless steel "C" channels shall be provided for easy mounting of the unit to the wharf.
 - .2 Cable gland plates shall be provided on the unit base.
 - .3 Four (4) lifting eyes shall be provided with each unit, located on the top of the unit.
- .8 Ground Fault Monitoring
 - .1 Panelboard to be provided with an integral ground fault sensing and monitoring unit and shall be single-level (monitoring for a single main circuit breaker).
 - .2 WP indicator lights ('Red' - LED) shall be mounted and visible on the outside of the substation enclosure and shall illuminate when a ground fault condition occurs.
- .9 Standard of Acceptance
 - .1 Acceptable factory manufacturer for distribution equipment: EATON 'Panelboards' marine line
EATON – Marina Power & Energy
149 Warwick Court, Williamsburg, Virginia, 23185
Toll Free: 1-800-723-8009
 - .2 Where alternate manufacturers are being offered by the submitting proponents, within their tender submission a full specification including: colour images, materials, finishes, arrangement drawing/ diagram, receptacle configuration, unit dimensioning and unit weight must be provide included for review and acceptance from the project stakeholders. Failure to comply will disqualify the proponents' submissions.

2.4 EQUIPMENT IDENTIFICATION

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

- .2 Nameplate for each panelboard size 4, engraved brass painted, with rivets or screws to the Enclosure.
- .3 Nameplate for each circuit in central distribution panelboards size 2, engraved brass painted, with rivets or screws to the enclosure.
- .4 Complete, laminated circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate the kiosks, substations, pedestals, and panelboards as indicated on the contract documents and mount securely, plumb, true and square to adjoining surfaces. Use only stainless steel fasteners, spacers, washers, and bracketry, as required for mounting. Use heavy rubber grommet washers for isolation of dissimilar metals or vibration, if necessary.
- .2 Check that installed breakers correspond to all downstream devices and equipment and are coordinated with short-circuit ratings and trip settings in accordance with the power study, prior to field installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 – General Electrical Requirements
- .2 Section 26 96 00 – Starting of Electrical Equipment and Systems.

1.2 DESCRIPTION

- .1 This section describes the requirements for furnishing a protective device coordination study for power distribution system.
- .2 Include in the quotation all costs for preparation of a complete System Coordination Study in accordance with the IEEE Standard 242, ‘Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems’, the IEEE Standard 1584-2002, ‘IEEE Guide for Performing Arc-Flash Hazard Calculations’, and CSA Z462-2008, ‘Workplace Electrical Safety’.
 - .1 The Study shall be prepared by an Engineering or Technical Service firm that regularly performs these types of Power Systems Studies and Analysis. The Study shall be performed or reviewed and sealed by a licensed Professional Engineer registered to practice in the Province of British Columbia.

Part 2 Products

2.1 Not Used

Part 3 Execution

3.1 STUDIES

- .1 The Coordination Study shall include all relevant distribution and protective devices within the following scope:
 - .1 “Upstream” devices to the utility level, including the curves of the utility transformer’s protective device; or, where no such device exists, the next upstream device in the Utility’s system;
 - .2 The transformer damage curve, in order that a complete coordination of the system is accomplished;
 - .3 “Downstream” devices to include the CDP main breaker.
- .2 A Short-Circuit Study shall be performed for the following busses within the following scope:
 - .1 Substation transformer secondary terminals;
 - .2 All 208 V/120 V panel boards.
 - .3 All scenarios shall be run with as-built breaker setting and feeder information entered into study model.
- .3 The work of the aforementioned studies shall include:

- .1 Liaison with the local utility for information on primary fuse and other protective devices, transformer data and system and substation capacities which affect the coordination of this system for both primary and any standby feeders;
 - .2 Liaison with distribution equipment Manufacturer to obtain actual trip curves of proposed protective devices for the new equipment;
 - .3 Recommendations shall be included, listing all deficiencies within the scope of the study and proposing methods of correction for each deficiency.
 - .4 Short-circuit study shall be produced based on the highest available fault current available from the Utility.
- .4 The Coordination Study report shall include the following:
- .1 Each Time-Current graph shall be printed in colour. The selected colours or hatching pattern will allow the end-user to easily discriminate between different device curves, especially on complicated graphs where devices overlap.
 - .2 The Time-Current curves shall be drawn on special log graphs with time coordinate range of 0.01 to 1,000 seconds and current coordinate ranges of 4 orders. The entire distribution system shall be subdivided into portions so that the curve for each device clearly shows its relationship to associated upstream and downstream devices. The coordination study should separate the emergency power from the normal power distributions. Each graph for a portion of the system shall include/show the following:
 - The portion of the distribution system represented by the devices on the graph shall be represented by a single line diagram drawn in the corner of the Time-Current coordination graph.
 - Each device curve shall end at the 3-phase symmetrical fault level calculated for that bus, based on the results of the short-circuit study.
 - Cable, Bus, or Conductor damage curves shall be shown where appropriate. All Transformer inrush, damage and overload curves shall be shown.
 - Motor starting curves and protective devices shall be shown for all motors within the scope of the study.
 - Include ground fault protection coordination within the scope of the study.
 - .3 On the graphs, or on the same page as the graph, all protective device curves within the scope of the graph shall be shown with the following information:
 - Relay curves with text indicating; Manufacturer, Type, Current Transformer size, Tap or Pickup setting, Time Dial settings, and curve type.
 - Fuse curves with average melting curve for low voltage fuses and minimum melt and total clearing for high voltage fuses with text indicating; Manufacturer, Type, Ampacity, Voltage, and Speed.
 - Static-Trip Breaker curves with text indicating; Breaker and Trip Unit Manufacturer and type, Current Transformer and Sensor Type, and all trip unit settings.
 - Thermal-Magnetic Breaker curves with text indicating; Breaker type, Trip rating, and instantaneous trip settings.
- .5 Include tables within the Study that clearly list all protective devices within the scope of the study and all associated information. These tables are to be based on settings established

and noted in the coordination curves. The tables shall be logically arranged and grouped to effectively present the following information:

- .1 Transformers; including size, type, configuration, voltage, and impedance.
 - .2 Fuses; including Manufacturer, type, ampacity, voltage, speed.
 - .3 Static Trip Units; including Manufacturer, type, CT, sensor or plug, all protective settings.
 - .4 Thermal-Magnetic Trip Units; including Manufacturer, rating, and instantaneous setting.
 - .5 All protective devices shall be listed with clear descriptive text to identify their place within the distribution system.
 - .6 All protective devices shall have a reference to the Time-Current graph where they are shown.
 - .7 The tables shall list all recommended settings of all protective devices within the scope of the study. This will allow the end-user to identify and plan for required changes to protective device settings, and to determine which settings have been implemented within this contract.
- .6 The work of the Short-circuit study shall include:
- .1 Evaluation and documentation of 3-phase and single-line-to-ground short-circuit fault levels at all evaluated distribution busses and panel board locations within the scope listed above.
 - .2 The output of the short-circuit study shall be a printed tabulation of asymmetrical and symmetrical RMS short-circuit current values, including X/R ratios.
 - .3 All significant sources and impedances shall be evaluated, including but not limited to, power utility and Stand-by emergency sources, motors, cables, transformers, reactors, and any other devices impacting upon the available short-circuit.
- .7 The Device Evaluation study shall include:
- .1 All pertinent interrupting devices within the scope of the job shall be listed with its interrupting rating or its series interrupting rating as applicable.
 - .2 A cross reference in table form shall be provided whether the protective devices at each bus are appropriate for the available fault current at each bus.
- .8 A final engineering report shall be completed including all graphs, tables, findings, and recommendations listed above. Provide one copy in colour in electronic format (pdf file). Also included shall be the following items:
- .1 Review the ground fault protection to ensure proper ground fault protection of the system.
 - .2 Review the application of protective devices and CT configurations and list omissions in proper protection of electrical apparatus.
 - .3 A clear and concise listing of deficiencies found upon completion of the protection and coordination studies.
 - .4 For each deficiency, an associated recommended solution, including 'order of magnitude' budget pricing (not including design and/or drawings).

- .9 Submit the report for Departmental Representative review the findings of all protective devices. The review will not eliminate the responsibility of the Contractor to provide proper coordination of the breaker and relay settings for all equipment supplied.
- .10 A preliminary report shall be prepared and submitted to the Departmental Representative for review and approval as part of the shop drawing submittal provided for the downstream equipment. This initial report shall include all proposed equipment characteristics, protection devices, etc, and shall use estimated feeder lengths.
- .11 The preliminary report shall be updated at the end of construction to account for any and all changes made during the course of the project. Feeder lengths, equipment modifications, actual overcurrent protective device settings, etc, shall be incorporated into the final report.
- .12 Delivery of the final report shall be made a minimum of four (4) weeks prior to request for Substantial Performance.
- .13 Prior to final inspection, the Contractor shall arrange for distribution equipment Manufacturer's Representative to visit site to check all settings and ensure they are in accordance with coordination study values.
 - .1 The Contractor is responsible to coordinate and provide the correctly rated devices for the electrical system. This includes providing suitably rated distribution, equipment, panel boards, breakers, etc. Upon evaluation of the various power studies the Contractor shall replace the existing equipment, that was proposed to be maintained, but is as a result of the coordination study, is required to be replaced or upgraded. This work shall be included in the Contract and will not be considered as an extra cost to the Contract Price.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 61 00 – Product Requirements.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal and with the Waste Reduction Workplan.
- .2 Avoid using landfill waste disposal procedures when recycling facilities are available.
- .3 Place materials defined as hazardous or toxic waste in designated containers.

1.4 STANDARDS

- .1 Use transformers of one manufacturer throughout the project.
- .2 Transformers to be built in accordance with CSA standard C9-M1981 (R2001) for dry-type transformers and tested in accordance with this standard.

1.5 TESTS

- .1 Submit full certified performance test data including noise levels for review prior to manufacture.

1.6 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 26 05 00 – Common Work Results for Electrical.

Part 2 Products

2.1 STANDARD TRANSFORMERS (TYPE I)

- .1 Type: ANN, 600 volts, 3-phase delta primary.
- .2 Primary taps: 2x 2 1/2% full capacity taps above and 2x 2 1/2% taps below the nominal voltage.
- .3 Secondary: 3-phase, 60 Hz 120V/208V 4-wire Y (see drawings for kVA rating). Electrostatic shielded grounded star secondary.
- .4 Class H, 220 °C insulation with temperature rise not exceeding 150 °C maximum in 40 °C ambient.
- .5 Efficiency: Energy Star rating (min. 97%)
- .6 Basic Impulse Level (BIL): standard.
- .7 Hipot: standard.

- .8 Windings: High grade copper windings, double dipped, vacuum impregnated high temperature non hygroscopic silicon varnish.
- .9 Impedance: Sizes 225 kVA and below to be between 4.5 and 5%. Sizes 225 kVA up to 450 kVA to be between 5 and 6%.
- .10 Average Sound Level: Noise emission shall not exceed 50 dB at full-load
- .11 Impedance at 17 °C: standard.
- .12 Enclosure: air ventilated, EEMAC 1, removable metal front panel "sprinkler-proof" design. Provide angled louvres for ventilation slots to prevent entrance of water from the sprinkler fire protection system. Air cooled type, natural circulation in ventilated enclosure.
- .13 Mounting: provide external vibration isolator kit. Provide "Super W Pads" Neoprene.

2.2 DRY-TYPE TRANSFORMERS FOR EXPOSED MARINE ENVIRONMENT

- .1 Rating as indicated.
- .2 Copper winding.
- .3 Resin-encapsulated core-coil assembly specially designed to completely seal out moisture and other contaminants for reliable performance in extreme environments.
- .4 NEMA 4X, Grade 316 Stainless Enclosure.
- .5 180 °C insulation system with 115 °C winding temperature rise.

2.3 VIBRATION AND SEISMIC CONTROL

- .1 Vibration and Seismic control shall meet the requirements of current BC Building Code and Supplements, and the seismic consultant.
- .2 Vibration and Seismic hardware to control static deflection.
- .3 Transformer equipment to be vibration isolated from the building structure by means of approved Neoprene isolators. Isolation system to have a mutual frequency no higher than one-third of the fundamental frequency.
- .4 Provide inspection services by a qualified isolator manufacturer's representative during and after installation. Provide concise written reports accepting the installation and stating any deficiencies. Correct any deficiencies noted. Include all costs associated with the above in the base tender

Part 3 Execution

3.1 MOUNTING

- .1 Mount dry type transformers on floor unless otherwise noted on drawings.
- .2 Provide 100mm concrete house-keeping base pad unless otherwise detailed.
- .3 Ensure adequate clearance around transformer for ventilation.
- .4 Install transformers in level upright position.
- .5 Remove shipping supports only after transformer is installed and just before putting into service.
- .6 Loosen isolation pad bolts until no compression is visible.

3.2 CONNECTIONS

- .1 Make primary and secondary connections in accordance with the manufactures diagrams.
- .2 Check all factory connections for correct tightness before energization.
- .3 Torque the building system wiring transformer connections using a torque wrench set to the manufacturers recommended settings. Note the torque setting on the equipment identification label for future maintenance reference.
- .4 All external wiring connections to transformer casing shall be enclosed in flexible conduit. Typically minimum 900mm flex to minimize vibration transmission to building structure.
- .5 Conduit to only enter transformers within the bottom third of the transformer casing (to minimize heat transfer to conduit).
- .6 Energize transformers immediately after installation is completed, where practicable.

3.3 EQUIPMENT IDENTIFICATION

- .1 Size 7 label in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Include the transformer identification (as indicted on the project drawings), primary power source equipment designation, equipment served and torque setting of connections (e.g. Transformer T1, served from CDPH-1, serving CDPL-1, Cable Connection Torque x Nm).

3.4 GROUNDING

- .1 Provide a ground conductor with all feeder runs to dry type transformer installations. The ground shall be either green insulated or identified and connected as a ground to the ground pad in the transformer enclosure and thence to the secondary neutral of the transformer. From the transformer ground pad make cable connection to non-current carrying ground of the distribution centre or panel supplied from transformer.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 28 16 – Moulded Case Circuit Breakers.

1.2 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.31-10, Switchgear Assemblies.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC G8-3.3-89, Metal Enclosed Interrupter Switchgear Assemblies.

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 low voltage switchgear 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 the Province of British Columbia.
 - .2 Indicate on drawings:
 - .1 Floor anchoring method and foundation template.
 - .2 Dimensioned cable entry and exit locations.
 - .3 Dimensioned position and size of bus.
 - .4 Overall length, height and depth of complete switchgear.
 - .5 Dimensioned layout of internal and front panel mounted components.
- .4 Certificates:
 - .1 Submit certified factory test results.
- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

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 low voltage switchgear and components for incorporation into manual.

1.5 EXTRA STOCK MATERIALS

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect low voltage switchgear from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Switchgear assembly: to CSA C22.2 No.31, EEMAC G8-3.3.

2.2 RATING

- .1 Secondary switchgear: indoor, 120/208V, 1200A, 3-phase, 4-wire, 60 Hz, minimum short-circuit capacity 25 kA (RMS symmetrical).

2.3 ENCLOSURE

- .1 Main incoming section to contain:
 - .1 Moulded case circuit breaker with LSIG electronic trip sized as indicated.
 - .2 Digital metering system.
- .2 Distribution sections to contain:
 - .1 Moulded case circuit breaker sized as indicated.
 - .2 Copper bus, from main section to distribution sections including vertical bussing.
- .3 Blanked off spaces with bus stabs and hardware for mounting future units.
- .4 Metal enclosed, free standing, floor mounted, dead front, indoor, CSA Enclosure, Type 2 cubicle unit.
- .5 Access from front.
- .6 Steel channel sills for base mounting in single length common to multi-cubicle switchboard.
- .7 Provision for future extension on both sides.
- .8 Space heater: 120V, 250W, 60 Hz, single-phase, in each cubicle, complete with thermostat and disconnect switch.

- .9 Receptacle: 120V, single-phase, 60 Hz, duplex, U-ground, in each cubicle.

2.4 BUSBARS

- .1 Three-phase and 100% rated bare busbars, continuous current rating 1200A self-cooled, extending full width of multi-cubicle switch board, suitably supported on insulators.
- .2 Main connections between bus and major switching components to have continuous current rating to match major switching components.
- .3 Busbars and main connections: 99.30% minimum conductivity copper.
- .4 Allow for extension of bus on both sides of unit without need for further drilling or preparation in field.
- .5 Tin plated joints, secured with non-corrosive bolts and Belleville washers.
- .6 Identify phases of busbars by suitable marking.
- .7 Busbar connectors, when switchboard shipped in more than one section.

2.5 GROUNDING

- .1 Copper ground bus not smaller than 50mm x 6mm extending full width of multi-cubicle switchboard and situated at bottom.
- .2 Lugs at each end for size #6 AWG grounding cable.

2.6 MOULDED CASE CIRCUIT BREAKERS

- .1 See Section 26 28 16 – Moulded Case Circuit Breakers.

2.7 INSTRUMENTS

- .1 Provide instruments c/w instrument transformers, as indicated on the drawings.

2.8 FINISHES

- .1 Apply finishes in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .1 Cubicle exteriors grey.
 - .2 Cubicle interiors white.

2.9 EQUIPMENT IDENTIFICATION

- .1 Identify equipment in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Nameplates:
 - .1 Red plate, white letters, size 7.
 - .2 Complete switchgear labelled: voltage, system configuration and main bus ampacity.
 - .3 Main cubicle labelled: "Main Breaker".
 - .4 Distribution units labelled (example): "Feeder No. 1 from panel ___ in Room ___, size ___".

2.10 SOURCE QUALITY CONTROL

- .1 Departmental Representative(s) to witness final factory tests.
- .2 Notify Departmental Representative(s) in writing five (5) days minimum in advance that switchgear assembly is ready for testing.

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 low voltage switchgear installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative(s) of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Locate switchgear assembly as indicated and bolt to base channels.
- .2 Connect main secondary power supply to main breaker.
- .3 Connect load side of breakers in distribution cubicles to distribution feeders.
- .4 Check factory made connections for mechanical security and electrical continuity.
- .5 Run one (1) grounding conductor 3 AWG bare copper in from existing ground bus in the room to MDP.
- .6 Check trip unit settings against coordination study to ensure proper working and protection of components.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
- .3 Section 26 05 00 – Common Work Results for Electrical.
- .4 Section 26 11 10 – Outdoor Power Pedestals.
- .5 Section 26 28 16 – Moulded Case Circuit Breakers.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2No.29-M1989 (R2000), Panelboards and Enclosed Panelboards.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

Part 2 Products

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer to match marine line equipment:
 - .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.
 - .3 Standard of acceptance: Cutler-Hammer Pow-R-Line series, combination panelboard.

- .2 Panelboards: bus and breakers rated for min. 10-18 kA (symmetrical) interrupting capacity or as indicated, based on short-circuit calculation presented by Contractor/ supplier.
- .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 Mains, suitable for bolt-on breakers, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two (2) keys for each panelboard and key panelboards alike.
- .6 Tin-plated aluminum bus with full size neutral.
- .7 CSA Type 3R with gasketed trim & concealed front bolts and hinges, for exposed, exterior locations. Refer to Section 26 11 10.
- .8 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank filler for all spaces.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02 – Moulded Case Circuit Breakers.
Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 °C ambient.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 Circuit breaker ratings and interrupting capacity as shown and to match existing breaker kA rating. 347/600V circuit breakers to have a minimum of 18,000A IC symmetrical RMS interrupting capacity rating. 120/208V circuit breakers to have a minimum of 10,000A IC symmetrical RMS interrupting capacity rating. Exact kA rating to be provided to Departmental Representative for review upon completion of the Power Study, adjust as required without additional cost to the contract.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2 Nameplate for each panelboard size 4 engraved.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true, and square, to adjoining surfaces.

- .2 Install surface-mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results for Electrical or as indicated.
- .4 Check for breaker installed correspond to short-circuit ratings and trip setting in accordance with coordination study, provide coordination study for review prior to field installation.
- .5 Provide lamacoid identification for all new breakers.

END OF SECTION

Part 1 **General**

1.1 SUMMARY

- .1 This Section includes Surge Protective Devices (SPD) or Transient Voltage Surge Suppressors (TVSS) for central distribution panelboards (rated at 120/208V or 347/600V).
- .2 Refer to drawings for general installation information. Follow manufacturers' recommendations for final installation requirements.

1.2 PRODUCT CERTIFICATION

- .1 Signed by the surge protection manufacturer certifying that products furnished comply with the specified requirements
- .2 Field Test Reports: Written reports of tests undertaken by the supplier to comply with all specified requirements
- .3 Maintenance Data: Transient voltage suppression devices to include operation and maintenance instructions specified in Division 26.
- .4 Warranties: minimum two (2) years.

1.3 DESCRIPTION

- .1 These specifications describe the electrical requirements for: Integrated Surge Protection Devices (SPD) for panelboards and switch boards for the
 - .1 Main service panels.

1.4 QUALITY ASSURANCE

- .1 Product must be made by a company engaged in the manufacture of such devices in the USA or Canada for a minimum of 10 years.
- .2 Source Limitations: Obtain suppression devices from a single manufacturer.
- .3 Product Options: specifications indicate system and electrical performance of suppressors and are based on the specific system indicated.
- .4 Electrical Components, Devices and Accessories: SPD compliance to: standards (UL 1449 2nd Edition, UL 1283, ANSI/IEEE C62.41, C62.45 and C62.11, NEMA LS 1-1992, MIL-STD-220AS, and CSA C22.2). All SPD products to be have been independently tested to verify published surge current ratings. Listed and labelled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 SCOPE OF WORK

- .1 Provide a complete Surge Protective Devices (SPD) or Transient Voltage Surge Suppressors (TVSS) for central distribution panelboards (rated at 120/208V or 347/600V).

1.6 INSTALLATION

- .1 Equipment to be installed as per code and manufacturers' recommendations.
- .2 Surge protective devices to be electrically disconnected during all high potential or MEGGAR testing of conductors or power distribution equipment.

1.7 FIELD QUALITY CONTROL

- .1 Testing: Perform the following field quality control testing:
 - .1 Before electrical circuitry has been energized, test for compliance with all SPD manufacturer's requirements.
 - .2 Complete start-up checks and voltage verifications according to manufacturers' written instructions.
 - .3 Perform visual and mechanical inspection on each unit. Certify with written report in O&M manuals that units are installed per manufacturer's recommendations.
- .2 Repair or replace malfunctioning units. Retest after repairs or replacements are made.

1.8 AS-BUIT INFORMATION

- .1 All surge protection system information shall be provided on the record drawings.
- .2 Provide:
 - .1 Equipment locations.
 - .2 Equipment identification for reference to shop drawings.
 - .3 Additional installation detail(s) as required to document the installation.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Switches, receptacles, wiring devices, cover plates, and their installation.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .3 Section 26 05 00 – Common Work Results for Electrical.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No.42-99 (R2002), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55-M1986 (July 2001), Special Use Switches.
 - .4 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

Part 2 Products

2.1 SWITCHES

- .1 20A, 120V, single-pole, double-pole, 3-way, 4-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

- .2 Manually-operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one (1) manufacturer throughout project.
- .5 Acceptable materials
 - .1 Hubbell HBL.1221 20A series.
 - .2 Leviton 1221-20A 120V series – 18221 347V.
 - .3 Pass & Seymour PS20AC1 120V series – PS37201(3)0 347V.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125V, 15A, U-ground, to: CSA-C22.2 No.42 with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight (8) back-wired entrances, 4-side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125V, 15A, U-ground with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four (4) back-wired entrances, 2-side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one (1) manufacturer throughout project.
- .5 Acceptable materials:
 - .1 Hubbell 5252 heavy duty, construction series.
 - .2 Leviton 5262 series.
 - .3 Pass & Seymour 5262 series.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, vertically-brushed, 1mm thick cover plates.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

- .6 Weatherproof double-lift spring-loaded, cast aluminum, cover plates, complete with gaskets for outlets in all exposed, exterior locations.
- .7 Weatherproof spring-loaded, cast aluminum, cover plates complete with gaskets for single outlets or switches in all exposed, exterior locations.

Part 3 Execution

3.1 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 – Common Work Results for Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates:
 - .1 Protect stainless steel or weatherproof cover plate finish with protective film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do **NOT** use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES:

- .1 Materials for moulded-case circuit breakers, circuit breakers, ground-fault circuit-interrupters, fused circuit breakers, and accessory high-fault protectors.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 19 – Construction/Demolition Waste Management and Disposal.
- .3 Section 26 11 10 – Outdoor Power Pedestals.
- .4 Section 26 24 17 – Panelboard Breaker Type.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 5-[02], Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Include time-current characteristic curves for breakers with interrupting capacity of 22,000A symmetrical (RMS) and over at system voltage.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters, fused circuit breakers, and Accessory high-fault protectors: to CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 °C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.

- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 Thermal-magnetic circuit breakers to have minimum bus rating of 22 kA symmetrical RMS interrupting capacity.

Part 3 Execution

3.1 INSTALLATION

- .1 Install circuit breakers as indicated.
- .2 Supply and install circuit breakers to correspond with the CDP and panelboards.
- .3 Check circuit breaker operation in accordance with the manufacturer's requirements.
- .4 Check breaker installed corresponds to short-circuit ratings and trip setting in accordance with coordination study; provide coordination study for review prior to field installation.
- .5 Provide lamacoid identification for all new breakers.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Refer to Section 01 33 00 – Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Refer to Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.

1.3 ENVIRONMENTAL PROTECTION

- .1 Refer to Section 01 35 43 – Public Impact and Environmental Mitigation.

Part 2 Products

2.1 DISCONNECT SWITCHES

- .1 Non-fusible and fusible disconnect switches in CSA Type 3R enclosures, to suit an exposed marine environment.
- .2 Fuseholder assemblies to CSA C22.2 No. 39.
- .3 Provision for padlocking in on and off switch positions by three locks.
- .4 Fuses as indicated. Allow for Class J or L for general circuits. Class RK5 for motor or other high inrush current circuits.
- .5 Fuseholders in each switch suitable without adaptors, for type of fuse as indicated.
- .6 Mechanically interlocked door to prevent opening when handle in ON position.
- .7 Quick-make, quick-break action.
- .8 ON-OFF switch position indication on switch enclosure cover.

Part 3 Execution

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses where indicated or required.
- .2 Install size 2 lamacoid nameplate indicating system name, voltage and phase, or as indicated.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

- .1 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.
- .2 Canadian Council of Ministers of the Environment (CCME)
 - .1 CCME PN 1326-[2008], Environmental Code of practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products (As referenced by CEPA 2008-197).
- .3 Canadian Gas Association (CGA)
 - .1 CGA Recommended Practice OCC-1-[2005], Control of External Corrosion on Buried or Submerged Metallic Piping Systems.
- .4 CSA International
 - .1 CSA C22.3 No. 4-[1974 (R2004)] Control of Electrochemical Corrosion of Underground Metallic Structures.
- .5 National Association of Corrosion Engineers (NACE)
 - .1 NACE SP0169-[2007], Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets for cathodic protection 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 Indicate location of anodes, test positions, connecting cables, wire splicing details, installation procedures, power supply, hardware and accessories.

1.4 DELIVERY, STORAGE AND HANDLING

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

- .3 Packaging Waste Management: removal of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.

Part 2 Products

2.1 EQUIPMENT

- .1 Provide complete cathodic protection system as indicated, to CSA 22.3 No.4 and comprising galvanic anodes with a design life, of fifteen (15) years minimum.

Part 3 Execution

3.1 INSTALLATION

- .1 Install system including bonding of system to structure, as indicated.
- .2 Locate test stations in weatherproof housings, as indicated.
- .3 Make joints and connections by means of compression fitting.
 - .1 Bond pipelines to metal structures.

3.2 CLEANING

- .1 Clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling and disposal in accordance with Section 01 74 19 – Construction/ Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 98 00 – Testing, Adjusting, and Balancing of Electrical Equipment.

1.2 COORDINATION

- .1 Coordinates starting of electrical equipment and systems with testing, adjusting and balancing, and demonstration and instruction of:
 - .1 Electrical equipment and systems specified in Division 26.
 - .2 Mechanical equipment and systems specified in Division 22.
 - .3 Other equipment and systems specified in other Divisions.
- .2 Where any equipment or system requires testing, adjusting or balancing prior to starting, ensure that such work has been completed prior to starting of electrical equipment and systems.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 STARTING MOTORS

- .1 Prior to starting motors:
 - .1 Verify phase rotation at motor starters (where applicable).
 - .2 Confirm motor nameplate data with motor starter heater overloads.

3.2 ENERGIZING EQUIPMENT

- .1 Complete all testing and provide testing result to Departmental Representative prior to energizing equipment.
- .2 Confirm equipment nameplate data with characteristics of power supply.

END OF SECTION

Part 1 General

1.1 INTENT

- .1 Except where otherwise specified, arrange testing, adjusting, balancing and related requirements specified herein.
- .2 If test results do not conform to applicable requirements, repair, replace, adjust or balance equipment and systems. Repeat testing as necessary until acceptable results are achieved.
- .3 Provide all labour, materials, instruments and equipment necessary to perform the tests specified.
- .4 All tests shall be witnessed by persons designated by the Departmental Representative, who shall also sign the test documentation.

1.2 RELATED WORK

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 96 00 – Starting of Electrical Systems and Equipment.

1.3 MANUFACTURER'S PRODUCTION TEST RECORDS

- .1 If requested, submit copies of production test records for production tests required by EEMAC and CSA standards for manufactured electrical equipment.

1.4 SITE TESTING REPORTS

- .1 Log and tabulate test results on appropriate test report forms.
- .2 Submit forms to Departmental Representative for approval prior to use.
- .3 Submit completed test report forms as specified, immediately after tests are performed.

1.5 REFERENCE DOCUMENTS

- .1 Perform tests in accordance with:
 - .1 The Contract Documents.
 - .2 Requirements of Authorities Having Jurisdiction.
 - .3 Manufacturers' published instructions.
 - .4 Applicable CSA, IEEE, IPCEA, EEMAC and ASTM Standards.
- .2 If requirements of any of the foregoing conflict, notify Departmental Representative before proceeding with test and obtain clarification.

1.6 SEQUENCING AND SCHEDULING

- .1 Except where otherwise specified, perform all testing, adjusting, balancing and related requirements specified herein prior to Interim Acceptance of the Work.
- .2 Perform voltage testing and adjusting after user occupancy or utilization of facility.

Part 2 Products

2.1 TEST EQUIPMENT

- .1 Provide all equipment and tools necessary to perform testing, adjusting and balancing specified herein and as otherwise required.

Part 3 Execution

3.1 FIRE ALARM SYSTEM TESTING – GENERAL (WHERE APPLICABLE)

- .1 Contractor will be responsible for directing verification of fire alarm system installation in accordance with:
 - .1 CAN/ULC-S537, Standard for Verification of Fire Alarm System Installations; and
 - .2 Requirements of Authority Having Jurisdiction.
- .2 Contractor shall be responsible for:
 - .1 Installing the devices as shown on contract drawings;
 - .2 Performing prerequisites to verification procedure; and
 - .3 Assisting and cooperating with certified company in verification procedure.
- .3 Fire alarm verification shall be performed with Departmental Representative present. Notify the Departmental Representative five (5) working days before the final verification.

3.2 FIRE ALARM SYSTEM TESTING – VERIFICATION (IF APPLICABLE)

- .1 The contractor and system manufacturer shall assist and cooperate with the Departmental Representative in verification procedure. The contractor shall provide and pay for the following:
 - .1 Arrange and ensure that the following parties are present at all times during verification procedures:
 - .1 Electrical Contractor.
 - .2 Fire alarm system manufacturer's representative.
 - .2 Provide the following equipment:
 - .1 Voltmeter.
 - .2 Sound pressure level meter.
 - .3 Smoke generator or aerosol test smoke.
 - .4 Four (4) portable communication devices.
 - .5 Scaffolding and ladders.
 - .3 Disassemble and reassemble system components.
 - .4 Disconnect and reconnect wiring.
 - .5 Perform required field adjustments.
 - .6 Repair defective work and replace defective components.
 - .7 Perform all work and tests on system required by verification procedure.
- .2 Do not proceed with verification unless Departmental Representative responsible for directing verification procedure is present.

3.3 TESTING OF WIRING AND WIRING DEVICES

- .1 All power and control wiring shall be tested for insulation resistance value with a 1000V Megger. Resistance values shall be as recommended by cable manufacturer. Test results shall be properly tabulated, signed, dated and submitted with maintenance manuals.
- .2 Test service grounding conductors for ground resistance.
- .3 Test all wiring devices for correct operation.
- .4 Test all receptacles for proper polarity and circuitry.

3.4 LOAD BALANCE TESTING

- .1 Perform load tests when as many loads as possible, prior to Substantial Performance of the Work, are operable.
- .2 Turn on all possible loads.
- .3 Test load balance on all feeders at distribution centres and panelboards.
- .4 If load imbalance exceeds 15%, reconnect circuits to balance loads.

3.5 VOLTAGE TESTING AND ADJUSTING

- .1 Test voltage at all panelboards.
- .2 Test voltage at motor starters.
- .3 Adjust transformer tap settings to compensate for under-voltage or over-voltage conditions, if directed to do so by Departmental Representative.

END OF SECTION

PROJECT NO. 9R306-2
IOS – TIMBER AND CONCRETE FLOATS A, B, C & D
FISHERIES AND OCEANS CANADA
SIDNEY, BC

Appendix A
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EF 130	Certificate of Penetrations through Separations (Where Applicable)
EF 131	Certificate of Seismic Restraint Installation (Where Applicable)
EF 132	Certificate of Acoustic and Vibration Isolation (Where Applicable)
EF 140	Checklist and Record – Spares to be Delivered to Facility
EF 141	Checklist – Departmental Representative Demonstrations
EF 142	Checklist – Substantial Performance Submissions – Electrical / Mechanical
EF 143	Certificate of Substantial Performance – Electrical / Mechanical
EF 144	Checklist – Work Remaining after Substantial Performance
EF 145	Certificate of Total Performance – Electrical / Mechanical

1.1 EF 100 CHECKLIST – SUBMISSIONS TO DEPARTMENTAL REPRESENTATIVE

ITEM	CHECKED BY	DATE
(5) WORKING DAYS BEFORE CLOSE OF SUBTRADE TENDER – Request for addition of acceptable manufacturers		
(10) WORKING DAYS AFTER AWARD OF THE CONTRACT – List of equipment suppliers and subtrades (EF 110) – Detailed price breakdown (EF 112)		
WHEN AVAILABLE TO SUIT SCHEDULE – Shop drawings and Product Samples (EF 111)		
WITH EACH APPLICATION FOR PROGRESS PAYMENT – Price Breakdown (Schedule of Values) (EF 112)		
PRIOR TO DEMONSTRATION OF SYSTEMS – Demonstration Agenda		
DEMONSTRATION OF SYSTEMS – Checklists for sign off of Demonstrations (EF 141)		
(10) WORKING DAYS PRIOR TO SUBSTANTIAL PERFORMANCE – Submission of items listed on Form EF-142		
WHEN REQUESTING REVIEW OF OUTSTANDING WORK – Checklist of work remaining (EF 144) – Certificate of Total Completion (EF 145)		

1.2 EF 110 EQUIPMENT/ SUB-TRADE LIST

ITEM	Company/ Supplier
Distribution & Transformers	
Power Pedestals	
Wiring Devices	
Luminaries	
Telecom System (Facility Preferred Vendor)	
Telecom Sub-trade (Facility Preferred Vendor)	
Fire Alarm System (Where Applicable)	
Testing and Commission Agency	
Other	

1.3 EF 111 CHECKLIST – SHOP DRAWINGS AND PRODUCT AND SAMPLES

ITEM	DATE SUBMITTED	REVIEW	
		ACTION	DATE
Distribution, Breakers & Transformers			
Power Pedestals			
Wiring Devices			
Luminaires (list groups)			
Telecom System			
Fire Alarm System (Where Applicable)			
Other			

NOTES:

- .1 Modify list where required.
- .2 Submit samples where indicated to the Departmental Representative for review prior to installation.

1.4 EF 112 PROGRESS CLAIM SUMMARY – DIVISIONS 22, 26, 31, 32 & 33

PROJECT: IOS – Timber & Concrete Floats A, B, C & D CLAIM NO: _____

Electrical / Mechanical Upgrades FOR MONTH OF: _____

ITEM		PRICE		WORK TO DATE		PREVIOUS WORK		THIS PERIOD	
		\$	%	\$	%	\$	%	\$	
Base Contract:									
General Conditions									
Mobilization (not to exceed 2%)									
Demolition & Removal									
Site Work & Trenching	Mat. Lab.								
Conduit, Boxes & Wire	Mat. Lab.								
Distribution Equipment	Mat. Lab.								
Power Pedestals	Mat. Lab.								
Wiring Devices	Mat. Lab.								
Lighting	Mat. Lab.								
Telecom Modifications	Mat. Lab.								
Fire Alarm Modifications	Mat. Lab.								
Mechanical Branch Connections	Mat. Lab.								
O & M Manuals & Record Drawings									
Testing & Commissioning									
Subcontracts									
Other									
Total Base Contract									
Change Order Summary									
Total Change Orders									
Total Contract:									
Amount due less 10% holdback									

Submit this form as called for on **EF 100** for tender price breakdown and for each progress claim

1.5 EF 120 CHECKLIST – COLOUR CODING

Obtain sign-off from Departmental Representative prior to colour coding systems.

Project Identification: e.g. _____

	SYSTEM	MAJOR BAND	MINOR BAND	CHARACTERS
1	120/208 volt Non-Essential			
2	347/600 volt Non-Essential			
3	277/480 volt Non-Essential			
4	Telecom System			
5	Fire Alarm System			
6	Other Life Safety Sys. (Where Applicable)			
7	Other			

Prepared By _____

Departmental Sign-off _____ Date _____

1.6 EF 130 CERTIFICATE OF PENETRATIONS THROUGH SEPARATIONS

Project Identification: _____

I hereby declare that I _____

am an employee/ a principal of _____

and have personally witnessed that all electrical service penetrations through fire separations (rated & non-rated) and sound separations in the following areas have been properly sealed in accordance with the specified requirements.

Signed _____ Date _____

AREA	SIGNED	DATE
Site Area:		
Site Area:		
Site Area:		

NOTES:

- .1 This certificate shall be submitted to the Departmental Representative prior to Substantial Performance.

1.7 EF 131 CERTIFICATE OF SEISMIC RESTRAINT INSTALLATION

Project Identification: _____

I hereby declare that I _____

am an employee/ a principal of _____

and certify that the seismic restraint of all electrical equipment and wiring system installation meets the requirements of the B.C. Building Code as it relates to seismic restraint and the Schedules S-B & S-C have been submitted and signed and addressed to the Departmental Representative.

Signed _____ Date _____

NOTES:

- .1 This certificate shall be submitted to the Departmental Representative prior to Substantial Performance.

1.8 EF 132 CERTIFICATE OF ACOUSTIC AND VIBRATION ISOLATION

Project Identification: _____

I hereby declare that I _____

am an employee/ a principal of _____

and do certify that the vibration isolation installation for the electrical equipment has been satisfactorily completed.

Signed _____ Date _____

NOTES:

- .1 This certificate shall be submitted to the Departmental Representative prior to Substantial Performance

1.10 EF 141 CHECKLIST – DEPARTMENTAL REPRESENTATIVE DEMONSTRATIONS

SYSTEM/ ITEM	CONTRACTOR		FACILITY	
	SIGNED	DATE	SIGNED	DATE
Distribution Operation				
Power Pedestals				
Lighting System Control (Where Applicable)				
Telecommunication Systems				
Access to Equipment				
Review of Maintenance Manual				
Items of Required Maintenance				
Other				

NOTES:

- .1 Contractor shall submit copies of this form with each appropriate item signed and dated by the person having overall charge of commissioning prior to Substantial Performance. (See **EF 143**).
- .2 Departmental Representative shall sign-off each item during or after the demonstration.
- .3 Contractor to strike out items where they do not apply to the systems being demonstrated.
- .4 Where multiple identical controls are installed the Departmental Representative may elect to only witness sample items, but the person having charge of commissioning is expected to have checked them all.

**1.11 EF 142 CHECKLIST – SUBSTANTIAL PERFORMANCE SUBMISSIONS –
 ELECTRICAL / MECHANICAL**

SECTION	ITEM	DATE	STATUS
Div. 26	Final Electrical Inspector or Safety Authority Certificate		
	Fire Stop Penetration Certificate. (EF-130) (Where Applicable)		
	Acoustic & Vibration Isolation Certificate. (EF-132) (Where Applicable)		
Div. 01	Spares Handed Over to Facility Checklist (EF 140)		
Div. 26	Identification		
Div. 01	Record Drawings		
Div. 01	Operating & Maintenance Manuals – Electrical / Mechanical		
	Seismic Engineer Report and Schedules (EF131) (Where Applic.)		
Div. 26	Fire Alarm Verification Report (If Applicable)		
Div. 22 / 26	Contractors Letter of Guarantee		
Div. 01	Demonstration to Operating Personnel - Agenda		
Div. 01	Demonstrations Checklists (EF 141)		
Div. 01	Substantial Performance Certificate (EF143)		
Div. 01	Checklist of Work Remaining after Substantial Performance (EF 144) .		

NOTES:

- .1 This list is provided as a checklist and may not include all Substantial Performance requirements.

1.12 EF 143 CERTIFICATE OF SUBSTANTIAL PERFORMANCE – ELECTRICAL / MECHANICAL

I hereby certify that I _____
am an employee / a principal / an agent

of _____

and have personally witnessed the following with regard to the electrical systems work specified for the above project and that to the best of my knowledge except as noted on **EF 144** (attached);

- The installation is complete and as specified.
- The systems have been commissioned and operate satisfactorily.
- Every control sequence and every control performs as specified.
- The systems are clean.
- All of the required submissions have been made to the Departmental Representative.

Signed _____ Date _____

NOTES:

- .1 This certificate must be completed and submitted to the Departmental Representative prior to Substantial Performance.
- .2 If it is apparent that the systems or their operation are seriously deficient then all reasonable costs and departmental Representative time charges relating to any subsequent field reviews shall be deducted from the contract sum.

1.14 EF 145 CERTIFICATE OF TOTAL PERFORMANCE – ELECTRICAL / MECHANICAL

I hereby certify that I _____
am an employee / a principal / an agent

of _____

and have personally witnessed that each item of outstanding work on the checklist and record of work remaining after substantial completion EF 144 (attached) has been satisfactorily completed and I hereby certify that the Electrical systems work specified on the above project is complete.

Signed _____ Date _____

NOTES:

- .1 This certificate must be completed and submitted to the Departmental Representative when requesting Total Performance.
- .2 If it is apparent during the final review that the systems or their operation are seriously deficient then all reasonable costs and Departmental Representative time charges relating to any subsequent site reviews shall be deducted from the contract sum.

PROJECT NO. 9R306-2
IOS – TIMBER AND CONCRETE FLOATS A, B, C & D
FISHERIES AND OCEANS CANADA
SIDNEY, BC

Appendix A
ELECTRICAL
FORMS
Page 17 of 17

END OF APPENDIX A

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THURBER ENGINEERING LTD.

March 10, 2016

File: 11977

Stantec Consulting Ltd.
400 – 655 Tyee Road
Victoria, BC
V9A 6X5

**INSTITUTE OF OCEAN SCIENCES
MARINE SIDE ELECTRICAL UPGRADE
GEOTECHNICAL ASSESSMENT**

This report is an update to our March 2010 report that was prepared for the proposed Substation Building (previously named Substation 34) located at the north-west section of the Institute of Ocean Sciences property in North Saanich, BC.

Authorization to proceed with the current scope of work was provided by your email dated February 22, 2016.

It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

1. PROJECT AND SITE DESCRIPTION

We understand, based on our discussions with you and review of the attached aerial site plan provided on February 22, 2016 and drawings provided on March 9, 2016, that a slab on grade electrical powerhouse building is proposed for the parking area located on the south-side of the wharf access road adjacent to Substation 4 in the north-west portion of the property. The area is generally level and covered with asphalt. The proposed building will have an approximate footprint of 150 m².

2. GEOTECHNICAL INFORMATION

This report is an update of our March 2010 report and reflects our current understanding of the project. No additional subsurface investigation has been carried out in the preparation of this report. A site reconnaissance was undertaken by Brian Webster, P.Eng. on March 4, 2016 to review the proposed building location relative to the 2010 investigation for any changes that should be included in the updated report.

The results of the 2010 geotechnical investigation are provided below.



2.1 2010 Drilling Investigation

Five test holes (TH10-1 to TH10-5) were drilled on February 25, 2010 using a track mounted auger drill rig supplied and operated by Beck Drilling and Environmental Services Ltd. of Mill Bay, BC.

TH10-1 was drilled to a depth of 7.6 m near the south-west building corner. TH10-2 was drilled near the north-west building corner to a depth of 4.6 m below the existing ground surface. TH10-3 was drilled near the north-east corner of the proposed building encountering refusal on boulders at a depth of 1.8 m. TH10-4 was drilled toward the south-east building corner. Several attempts were made to advance the auger in this area. Refusal on boulders was encountered at a depth of 1.0 m below the existing ground surface. TH10-5 was drilled to 3.0 m depth at the then proposed pull-pit location within the building.

The results of the field and laboratory investigations were used to prepare the test hole logs that are provided in the Appendix. The test hole locations are shown on Drawing No. 19-5308-22-1 in the Appendix.

The drilling investigation was monitored for evidence of archaeological remains by an archaeologist from Golder Associates Ltd. (GAL). Environmental assessment of soil conditions was not included in our scope of work at that time.

3. SUBSURFACE CONDITIONS

A general description of the soil and groundwater conditions encountered at the building site during the 2010 drilling investigation is given below. The reader should refer to the appended logs for a more detailed description of conditions at each test hole.

Asphalt Pavement

An approximate 75 mm thick layer of asphalt pavement was encountered at all test hole locations.

Fill

A fill layer varying in thickness from approximately 0.9 m at TH10-4 to 3.9 m at TH10-1 was encountered at all test holes. The fill is variable generally consisting of silty clay to silty sand and gravel with some cobbly zones encountered at TH10-1 and -3.

Shell fragments were observed in TH10-1, -3 and -5 extending to depths of 1.2 m at TH10-3 to 6.0 m at TH10-1 below the existing ground surface. Wood debris was encountered up to 4.5 m depth in TH10-1. Concrete debris was encountered at TH10-3 at a depth of 1.2 m below the ground surface.



Sand

A 600 mm thick layer of silty sand was encountered below the clayey gravel fill layer at TH10-1 to a depth of 4.6 m below the existing ground surface.

Clay / Silt

Firm to very stiff, grey to grey-brown, silty clay was encountered below the silty sand layer at TH10-1 to the depth investigated. A 1.1 m thick layer of very soft, grey, silty clay was encountered below the sandy gravel fill layer at TH10-2 to the depth investigated. Organic silt was encountered at 4.5 m depth at TH10-1 and at TH10-5 at a depth of 0.7 m below the existing ground surface.

Rip-Rap

At TH10-3, rip-rap consisting of cobbles and boulders was encountered at a depth of 1.5 m below the existing ground surface and continued to the depth investigated.

Refusal / Groundwater

At TH10-3, auger refusal on boulders (rip-rap) was encountered at a depth of 1.8 m and at TH10-4 at a depth of 1.0 m below the existing ground surface. All other test holes were completed to their intended depths.

There was no free water in the test holes at the time of drilling. However, the soil below 3.0 m depth in TH10-1, below 2.8 m at TH10-2, and below 2.0 m at TH10-5 was noted to be wet at the time of drilling. These test holes are closer to the foreshore, where the water level is expected to vary with the tide.

4. GEOTECHNICAL RECOMMENDATIONS

The recommendations given in this section are based on the results of the 2010 investigation and our review of the current design drawings provided by Stantec. Any changes to the building footprint may require revisions to our recommendations.

4.1 Site Seismicity

The 2012 British Columbia Building Code specifies a design level earthquake that has a return period of 1 in 2,475 years. For this site, the peak firm ground acceleration for the 1:2,475 year event is 0.54g.

Based on the results of the geotechnical investigation, fill material varying in consistency from silty clay to gravelly sand and gravel covers the entire building site. Below the fill material, very soft to very stiff, native grey silty clay was encountered at the west end of the site. Toward the east side, silty and gravelly sand to silty clay fill overlies cobbles and boulders. Variable fill underlain by rip-rap is likely across most of the site.



A 600 mm thick layer of wet, compact silty sand was encountered at a depth of 4.0 m in TH10-1. This layer could be potentially liquefiable during a design seismic event. There is limited information available as to the extent of potentially liquefiable soils. However, we understand that given the type of structure and its intended use, liquefaction is not considered to be a design concern. Therefore, the site is classified as Site Class D for seismic design.

Figure 1 summarizes the spectral acceleration (S_a) for the site based on the information obtained from Natural Resources Canada's on-line seismic hazard value interpolator.

4.2 Site Preparation

The foundation design and site development recommendations given in the following sections are based on the assumption that liquefaction is not a design concern.

All asphalt pavement and existing fine grained fill material should be stripped/sub-excavated from the building footprint. Based on the results of the test hole investigation, 1.5 m of soil will need to be sub-excavated in some areas. The fill sub-grade should be inspected by a qualified geotechnical engineer to assess whether any additional sub-excavation is necessary (particularly if organic / wet soils are present at the base). A non-woven geotextile (Nilex 4545) or equivalent should then be placed on the subgrade to facilitate compaction and to prevent the migration of fines.

The sand and gravel deposit can likely be re-used as engineered fill, provided that it is not too wet and does not contain excess silt to achieve suitable compaction.

Native granular soils encountered at the base of the excavation should be surface compacted prior to the placement of engineered fill material. The entire surface should then be proof rolled with a loaded tandem axle dump truck to identify any soft or weak areas. These weak areas should be sub-excavated and backfilled with engineered fill.

Backfill used to bring the site up to the final design grade should consist of 75 mm minus, sandy gravel fill, with less than 5% passing the 0.075 mm sieve. The fill should be placed in maximum lift thickness of 300 mm and compacted to at least 97% of Standard Proctor Maximum Dry Density (SPMDD).

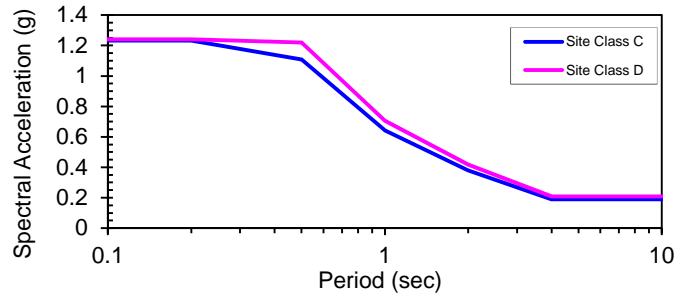
It is important that the overall site grade not be raised by more than 500 mm without further investigation and assessment as this may lead to increased settlement in the underlying clay deposits.

4.3 Foundations

Based on the results of the drilling program, compact to dense, sands and gravels, firm, silty to gravelly clays to cobbles and boulders will likely be encountered at the anticipated subgrade elevations over a large portion of the site after the sub-excavation of fill materials has been completed.



	SITE CLASS	Spectral Acceleration, Sa			
		0.2	0.5	1	2
Input ---->>	C	1.232	1.108	0.641	0.378
Calculated ---->>	D	1.24	1.22	0.71	0.42



From BC Building Code 2012 - Acceleration Based Site Coefficients, Fa

Site Class	Sa (0.2) - Spectral Acceleration at Period of 0.2 Seconds						
	0.01	0.25	0.5	0.75	1	1.25	10
A	0.7	0.7	0.7	0.8	0.8	0.8	0.8
B	0.8	0.8	0.8	0.9	1	1	1
C	1	1	1	1	1	1	1
D	1.3	1.3	1.2	1.1	1.1	1	1
E	2.1	2.1	1.4	1.1	0.9	0.9	0.9
F	-	-	-	-	-	-	-

From BC Building Code 2012 - Velocity Based Site Coefficients, Fv

Site Class	Sa (1.0) - Spectral Acceleration at Period of 1.0 Second						
	0.01	0.1	0.2	0.3	0.4	0.5	1
A	0.5	0.5	0.5	0.5	0.6	0.6	0.6
B	0.6	0.6	0.7	0.7	0.8	0.8	0.8
C	1	1	1	1	1	1	1
D	1.4	1.4	1.3	1.2	1.1	1.1	1.1
E	2.1	2.1	2	1.9	1.7	1.7	1.7
F	-	-	-	-	-	-	-

Calculated Site Coefficients From Spectral Acceleration Provided by NRC

Site Class	T (sec)	
	0.2	1
	Fa or Fv	
A	0.80	0.600
B	1.00	0.800
C	1.00	1.000
D	1.01	1.100
E	0.90	1.700

Calculated DESIGN Spectral Accelerations

Site Class	T (sec)						
	0.01	0.2	0.5	1	2	4	10
A	0.99	0.99	0.66	0.38	0.23	0.11	0.11
B	1.23	1.23	0.89	0.51	0.30	0.15	0.15
C	1.23	1.23	1.11	0.64	0.38	0.19	0.19
D	1.24	1.24	1.22	0.71	0.42	0.21	0.21
E	1.11	1.11	1.11	1.09	0.64	0.32	0.32



Boulders were encountered during drilling at TH10-3 and -4 to the depths investigated, and therefore localized areas of rip-rap could be encountered when excavating. If bedrock is encountered, it is recommended the rock be removed to allow at least 500 mm of engineered fill to be placed and compacted below the underside of footing elevation to provide a uniform bearing pad.

It is important that all foundation bearing surfaces be inspected by a qualified geotechnical engineer to confirm that the subgrade has been adequately prepared and is acceptable for the design bearing pressure.

4.3.1 Conventional Footings

Conventional strip and pad foundations bearing on the compact to dense, sand and gravel fill, or on compacted engineered fill can be considered for support of the building.

Foundations bearing on materials as described above can be designed for a serviceability limit state (SLS) bearing resistance of 150 kPa for less than 25 mm of settlement, and an ultimate limit state (ULS) bearing resistance of 225 kPa. For seismic loading, the SLS bearing resistance can be increased by 33%.

Some settlement of the unsaturated, loose to compact, granular deposits will occur following the design level earthquake. More detailed soils information is required to address this.

All strip footings should have a minimum width of 500 mm and be founded at a depth of at least 500 mm below the finished grade for frost protection, as well as, to achieve the specified bearing resistance. Pad footings should have a least dimension of 900 mm.

4.3.2 Raft Slab Foundation

Due to the variability between granular and cohesive soils and rock fill present across the site, there is potential for localized differential settlement to occur. Also, lateral seismic loading may cause differential horizontal movements. This site is located adjacent to the foreshore and is subject to fluctuating tidal water levels.

A raft slab foundation could be considered to address these issues and improve seismic performance. The raft slab foundation would be able to distribute the foundation loads more uniformly than conventional footings. Also, due to the rigidity of a raft foundation, overall settlement will be reduced under both SLS and ULS loading. The subgrade beneath the new foundations should be prepared as outlined in Section 4.2.



4.4 Groundwater Considerations

Free water was not encountered in any of the test holes at the time of drilling. However, increased wetness was observed in test holes closer to the foreshore that are influenced by tidal fluctuations. Dewatering through the use of sufficient pumps or wells should be utilized in order to maintain a dry excavation, and stable temporary cut slopes (Section 4.7). Dewatering should be made the responsibility of the contractor.

4.5 Slabs-on-Grade

All fine grained fill materials and organic soils as noted in Section 4.2 must be removed from beneath the floor slab area. At least 150 mm of free-draining (less than 5% passing the 0.075 mm – #200 sieve) granular fill with a maximum particle size of 25 mm should be placed beneath all slabs-on-grade. The sub-slab fill should be compacted to at least 97% of Standard Proctor Maximum Dry Density (SPMDD).

4.6 Perimeter Drainage

Standard perimeter drains should be provided around the entire perimeter of the structure. The foundation drainage system should be completely separate from any surface water collection systems including the roof drains. The final site grade should be shaped to direct water away from the building.

4.7 Temporary Excavations

The existing fill materials and compact to dense, sands and gravels should be sloped no steeper than 1H:1V. Temporary excavations in the firm clay should be sloped no steeper than 1.5H:1V.

Seepage could be encountered during excavation within the fill layer. Cut slopes should be made no steeper than 1H:1V provided groundwater is adequately controlled. Flatter slopes may be required if seepage is not effectively controlled. If there is not sufficient space to cut the slopes at the recommended angles, then shoring will be required.

If shoring is to be used it would be subject to Part 20 of the Occupational Health and Safety Regulation. The contractor should be made responsible for all temporary excavations, shoring and groundwater control. The contractor should be required to retain a qualified engineer for this purpose. Designs should be submitted to the owner for review by the owner's engineer.



5. CLOSURE

We trust that this report provides sufficient information for your needs. Should you require clarification of any item or additional information, please contact us at your convenience.

Yours truly,
Thurber Engineering Ltd.
Kevin Sterne, M.Sc., P.Eng.
Review Engineer

Brian Webster



Brian Webster, B.Eng., P.Eng.
Project Engineer

Attachments

Statement of Limitations and Conditions

Appendix:

- Unified Classification System for Soils
- 2010 test hole logs
- Test hole location plan (Drawing No. 19-5308-22-1)
- Aerial Site Plan



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

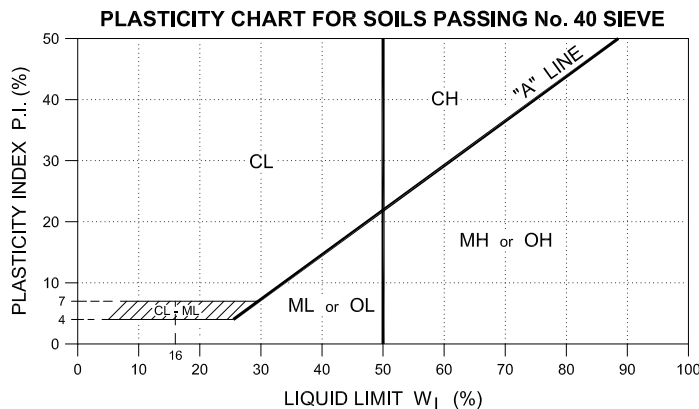
The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.





UNIFIED CLASSIFICATION SYSTEM FOR SOILS (ASTM D2487)

MAJOR DIVISION		SYMBOLS		TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
		GROUP	GRAPH			
COARSE-GRAINED SOILS (MORE THAN 50% BY WEIGHT RETAINED ON No. 200 SIEVE)	GRAVELS MORE THAN 50% COARSE FRACTION RETAINED ON No. 4 SIEVE	CLEAN GRAVELS ($< 5\%$ FINES)	GW		WELL GRADED GRAVEL and WELL GRADED GRAVEL with SAND.	$C_U = \frac{D_{60}}{D_{10}} \geq 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			GP		POORLY GRADED GRAVEL and POORLY GRADED GRAVEL with SAND.	NOT MEETING ABOVE REQUIREMENTS
		GRAVELS WITH FINES ($> 12\%$ FINES)	GM		SILTY GRAVEL, GRAVEL - SAND - SILT MIXTURES.	FINES CLASSIFY AS ML or MH ⁽³⁾
			GC		CLAYEY GRAVEL, GRAVEL - SAND - CLAY MIXTURES.	FINES CLASSIFY AS CL or CH ⁽³⁾
	SANDS MORE THAN 50% COARSE FRACTION PASSES No. 4 SIEVE	CLEAN SANDS ($< 5\%$ FINES)	SW		WELL GRADED SAND and WELL GRADED SAND with GRAVEL	$C_U = \frac{D_{60}}{D_{10}} \geq 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			SP		POORLY GRADED SAND and POORLY GRADED SAND with GRAVEL.	NOT MEETING ABOVE REQUIREMENTS
		SANDS WITH FINES ($> 12\%$ FINES)	SM		SILTY SAND, SAND - SILT MIXTURES.	FINES CLASSIFY AS ML or MH ⁽³⁾
			SC		CLAYEY SAND, SAND - CLAY MIXTURES.	FINES CLASSIFY AS CL or CH ⁽³⁾
FINE-GRAINED SOILS (MORE THAN 50% BY WEIGHT PASSES No. 200 SIEVE)	SILTS BELOW "A" LINE NEGLECTIBLE ORGANIC CONTENT	$W_L < 50\%$	ML		INORGANIC SILTS, SILTS with SAND and SILTS with GRAVEL and SANDY or GRAVELLY SILTS.	P.I. < 4 or PLOTS BELOW THE "A" LINE
		$W_L > 50\%$	MH		INORGANIC SILTS, SILTS with SAND & SILTS with GRAVEL & SANDY or GRAVELLY SILTS, FINE SANDY or SILTY SOILS.	P.I. PLOTS BELOW THE "A" LINE
	CLAYS ABOVE "A" LINE ON PLASTICITY CHART NEGLECTIBLE ORGANIC CONTENT	$W_L < 50\%$	CL		INORGANIC CLAYS of LOW PLASTICITY, GRAVELLY, SANDY, or SILTY CLAYS, LEAN CLAYS.	P.I. > 7 and PLOTS ON OR ABOVE THE "A" LINE
		W_L near 50%	CL-CH		BORDERLINE INORGANIC CLAYS and SILTY CLAYS with LIQUID LIMITS NEAR 50%.	(only used for visual identification)
		$W_L > 50\%$	CH		INORGANIC CLAYS of HIGH PLASTICITY, FAT CLAYS.	P.I. PLOTS ON OR ABOVE THE "A" LINE
	ORGANIC SILTS and CLAYS	$W_L < 50\%$	OL		ORGANIC SILTS and ORGANIC SILTY CLAYS of LOW PLASTICITY.	$\frac{W_L \text{ (oven dried)}}{W_L \text{ (not dried)}} < 0.75$
		$W_L > 50\%$	OH		ORGANIC CLAYS OF HIGH PLASTICITY.	$\frac{W_L \text{ (oven dried)}}{W_L \text{ (not dried)}} < 0.75$
HIGHLY ORGANIC SOILS		PT		PEAT and other HIGHLY ORGANIC SOILS.	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE.	



NOTES:

- ALL SIEVE SIZES ARE U.S. STANDARD, A.S.T.M. E11-04.
- COARSE GRAINED SOILS WITH 5 TO 12% FINES REQUIRE DUAL SYMBOLS (GW-GM, GW-GC, GP-GM, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC).
- IF FINES CLASSIFY CL-ML USE DUAL SYMBOL (GC-GM or SC-SM).
- WHERE TESTING IS NOT CARRIED OUT, THE IDENTIFICATIONS ARE DETERMINED BY VISUAL-MANUAL PROCEDURES DESCRIBED IN ASTM D2488-06.



SYMBOLS AND TERMS USED ON TEST LOGS

1. PARTICLE SIZE CLASSIFICATION OF MINERAL SOILS

DESCRIPTION	APPARENT PARTICLE SIZE
BOULDERS	> 200 mm
COBBLES	75 mm to 200 mm
GRAVEL coarse	19 mm to 75 mm
fine	4.75 mm to 19 mm
SAND coarse	2 mm to 4.75 mm
medium	0.475 mm to 2 mm
fine	0.075 mm to 0.475 mm
SILT	Non-plastic particles, not visible to the naked eye
CLAY	Plastic particles, not visible to the naked eye

NOTE: Metric Conversion is approximate only

2. TERMS DESCRIBING CONSISTENCY (Cohesive Soils Only)

DESCRIPTION	APPROXIMATE UNDRAINED SHEAR STRENGTH
Very Soft	Less than 10 kPa (250 psf)
Soft	10 to 25 kPa (250 - 500 psf)
Firm	25 to 50 kPa (500 - 1000 psf)
Stiff	50 to 100 kPa (1000 - 2000 psf)
Very Stiff	100 to 200 kPa (2000 - 4000 psf)
Hard	Greater than 200 kPa (4000 psf)

NOTE: Metric Conversion is approximate only

3. TERMS DESCRIBING DENSITY (Cohesionless Soils Only)

DESCRIPTION	STANDARD PENETRATION TEST
	Number of blows per foot (300 mm) *
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	over 50

* Directly applicable to sands and, with interpretation, to gravels

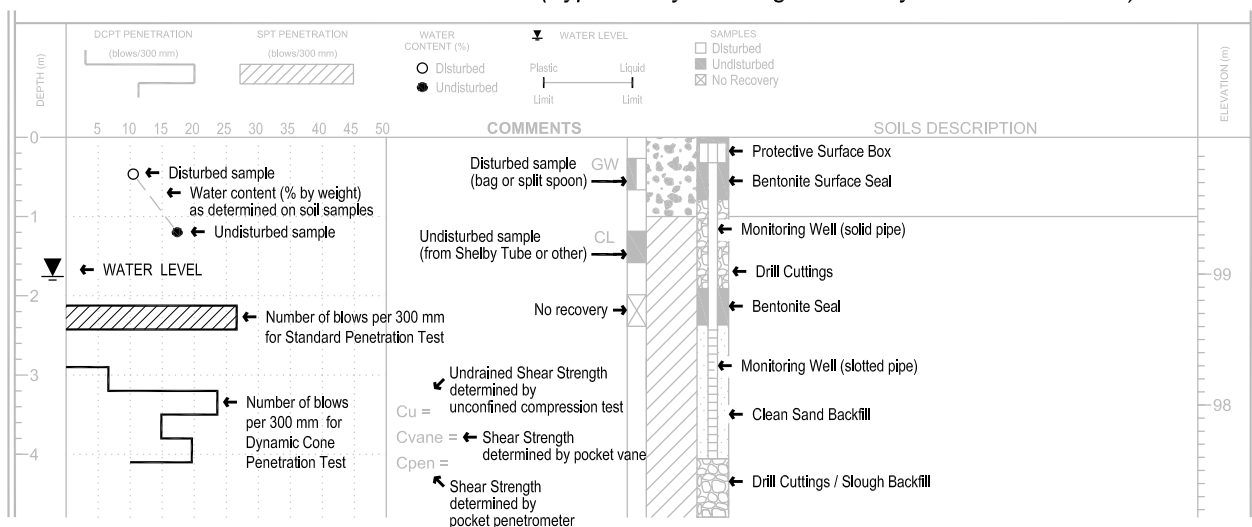
4. PROPORTION OF MINOR COMPONENTS BY WEIGHT

DESCRIPTION	PERCENT BY WEIGHT
and	35 to 50 %
y / ey	20 to 35 %
some	10 to 20 %
trace	less than 10 %

EXAMPLE: Silty SAND, trace of gravel = Sand with 20 to 35% silt and up to 10% gravel, by dry weight. (Percentages of secondary materials are estimates based on visual and tactile assessment of samples).

5. LEGEND FOR TEST HOLE LOGS

(Typical only showing commonly included elements)



LOG OF TEST HOLE

TEST HOLE NO.
TH10-1

LOCATION: See Drawing No. 19-5308-22-1

CLIENT: GENIVAR CONSULTANTS LTD.
PROJECT: Institute of Ocean Sciences Building

TOP OF HOLE ELEV:

METHOD: Solid Stem Auger

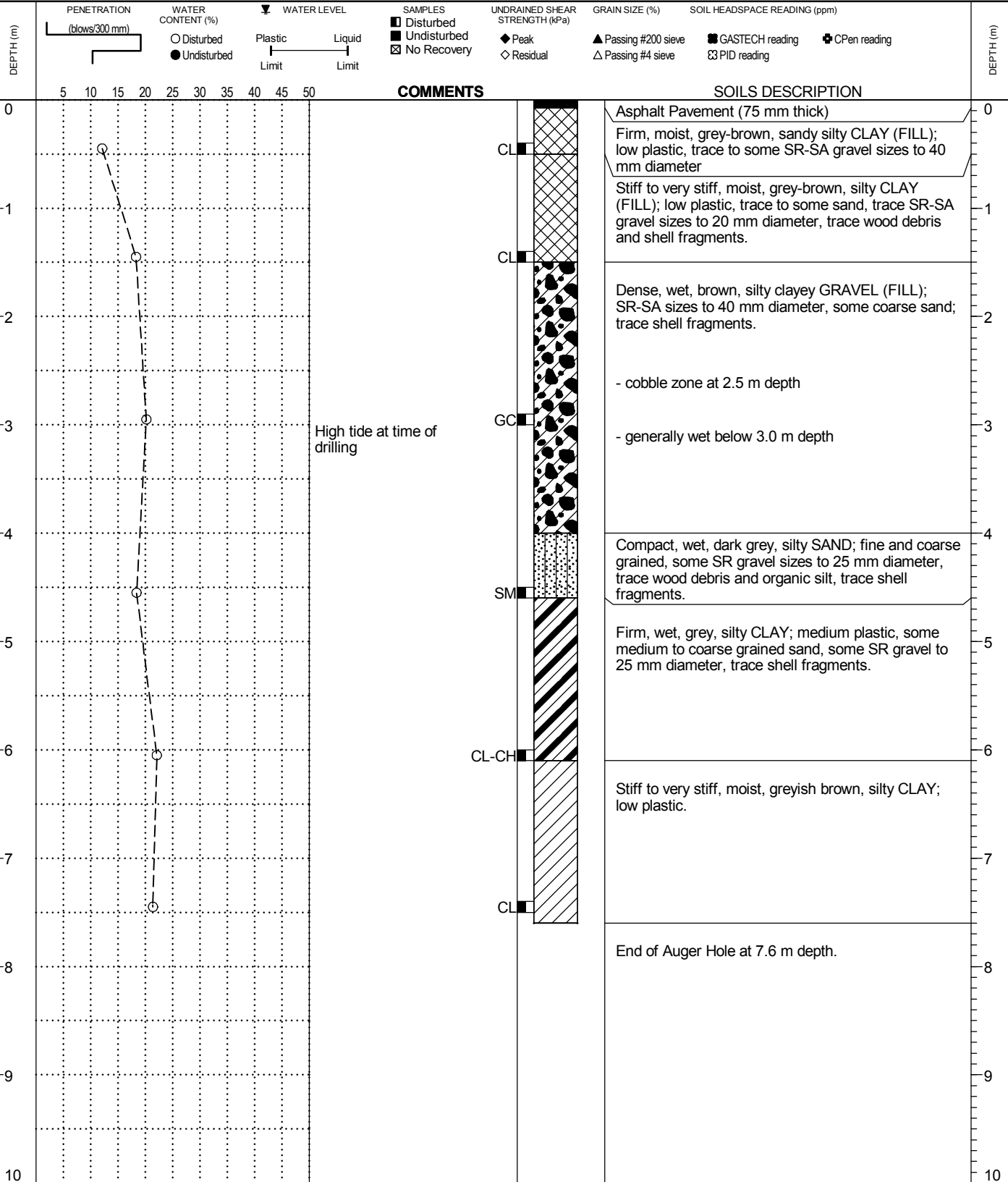
DRILLING CO.: Beck Drilling

INSPECTOR: AGW



DATE: 2010-Feb-25

FILE NO.: 19-5308-22



LOG OF TEST HOLE (NO EST.) BRW_19-5308-22_IOS BUILDING 2010 LOGS.GPJ_THURBER BC.GDT_3/10/10- THURBER VICTORIA MAY 2007.GLB

LOG OF TEST HOLE

TEST HOLE NO.
TH10-2

LOCATION: See Drawing No. 19-5308-22-1

CLIENT: GENIVAR CONSULTANTS LTD.
PROJECT: Institute of Ocean Sciences Building

TOP OF HOLE ELEV:

METHOD: Solid Stem Auger

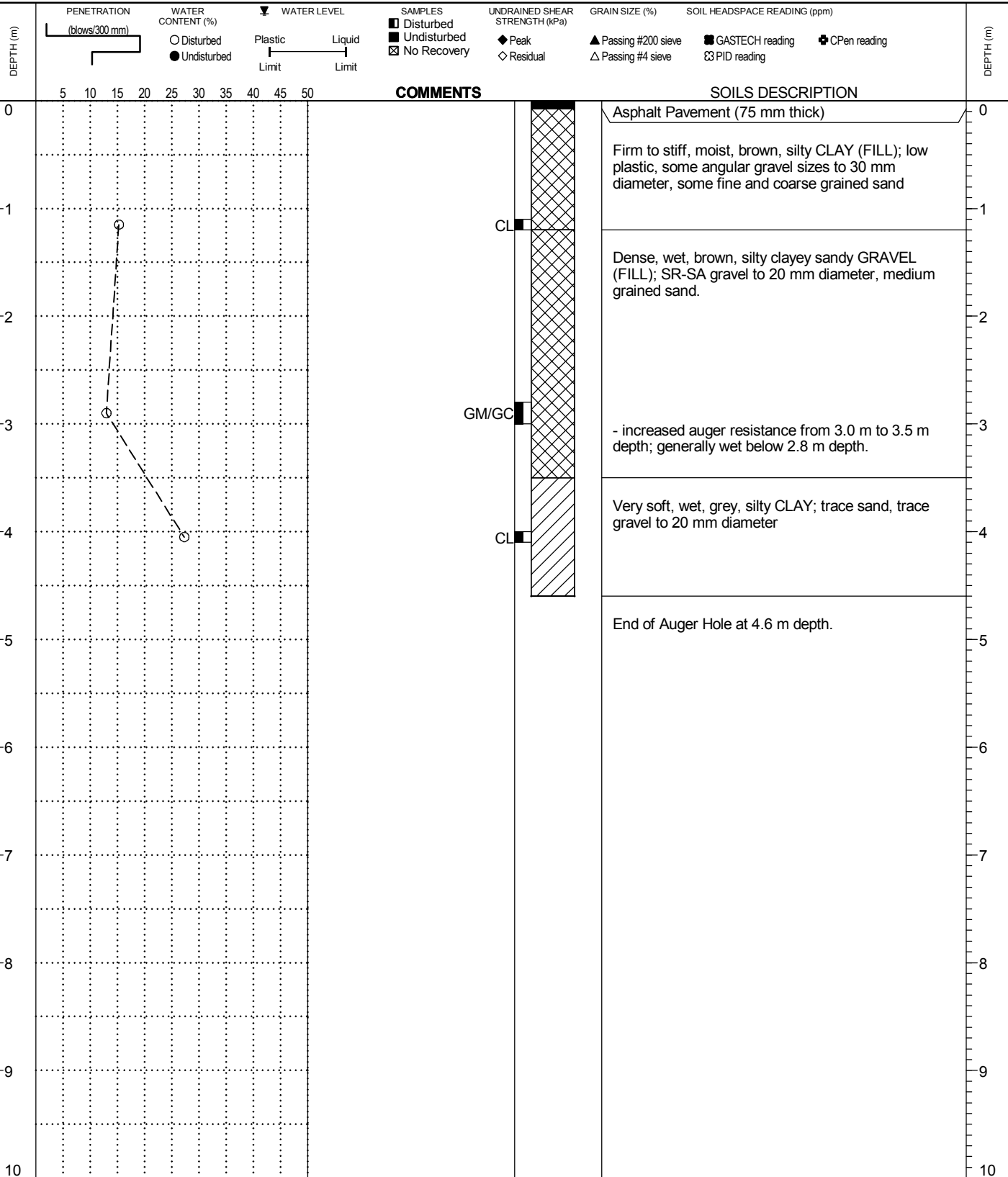
DRILLING CO.: Beck Drilling

INSPECTOR: AGW



DATE: 2010-Feb-25

FILE NO.: 19-5308-22



LOG OF TEST HOLE (NO EST.) BRW_19-5308-22_IOS BUILDING 2010 LOGS.GPJ THURBER BC.GDT 3/10/10- THURBER VICTORIA MAY 2007.GLB

LOG OF TEST HOLE

TEST HOLE NO.
TH10-3

LOCATION: See Drawing No. 19-5308-22-1

CLIENT: GENIVAR CONSULTANTS LTD.
PROJECT: Institute of Ocean Sciences Building

TOP OF HOLE ELEV:

METHOD: Solid Stem Auger

DRILLING CO.: Beck Drilling

INSPECTOR: AGW



DATE: 2010-Feb-25

FILE NO.: 19-5308-22

DEPTH (m)	PENETRATION (blows/300 mm)	WATER CONTENT (%) ○ Disturbed ● Undisturbed	WATER LEVEL ▼ Plastic Limit Liquid Limit	SAMPLES ■ Disturbed ■ Undisturbed ☒ No Recovery	UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual	GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve	SOIL HEADSPACE READING (ppm) ■ GASTECH reading ☒ PID reading ⊕ CPen reading	DEPTH (m)
0								Asphalt Pavement (80 mm thick)
0								Compact, moist, brown, gravelly SAND (FILL); fine to medium grained, SA-SR gravel to 30 mm diameter, some silt and concrete debris, trace clay and shell fragments. - cobble zone from 0.7m to 1.2 m depth
1	○			SM				Firm, moist, brown, gravelly CLAY (FILL)
1								Cobbles and boulders
2								End of Auger Hole at 1.8 m depth. Refusal on boulders.
3								
4								
5								
6								
7								
8								
9								
10								

LOG OF TEST HOLE (NO EST.) BRW_19-5308-22_IOS BUILDING 2010 LOGS.GPJ THURBER BC.GDT 3/10/10- THURBER VICTORIA MAY 2007.GLB

LOG OF TEST HOLE

TEST HOLE NO.
TH10-4

LOCATION: See Drawing No. 19-5308-22-1

CLIENT: GENIVAR CONSULTANTS LTD.
PROJECT: Institute of Ocean Sciences Building

TOP OF HOLE ELEV:

METHOD: Solid Stem Auger

DRILLING CO.: Beck Drilling

INSPECTOR: AGW



DATE: 2010-Feb-25

FILE NO.: 19-5308-22

DEPTH (m)	PENETRATION (blows/300 mm)	WATER CONTENT (%) ○ Disturbed ● Undisturbed	WATER LEVEL ▼ Plastic Limit Liquid Limit	SAMPLES ■ Disturbed ■ Undisturbed ☒ No Recovery	UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual	GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve	SOIL HEADSPACE READING (ppm) ■ GASTECH reading ☒ PID reading ⊕ CPen reading	DEPTH (m)
0								Asphalt Pavement (75 mm thick)
0								gravelly SAND and silty CLAY (mixed FILL)
1								End of Auger Hole at 1.0 m depth. Refusal on boulders.
2								
3								
4								
5								
6								
7								
8								
9								
10								

LOG OF TEST HOLE (NO EST.) BRW_19-5308-22_IOS BUILDING 2010 LOGS.GPJ THURBER BC.GDT 3/10/10- THURBER VICTORIA MAY 2007.GLB

LOG OF TEST HOLE

TEST HOLE NO.
TH10-5

LOCATION: See Drawing No. 19-5308-22-1

CLIENT: GENIVAR CONSULTANTS LTD.
PROJECT: Institute of Ocean Sciences Building

TOP OF HOLE ELEV:

METHOD: Solid Stem Auger

DRILLING CO.: Beck Drilling

INSPECTOR: AGW

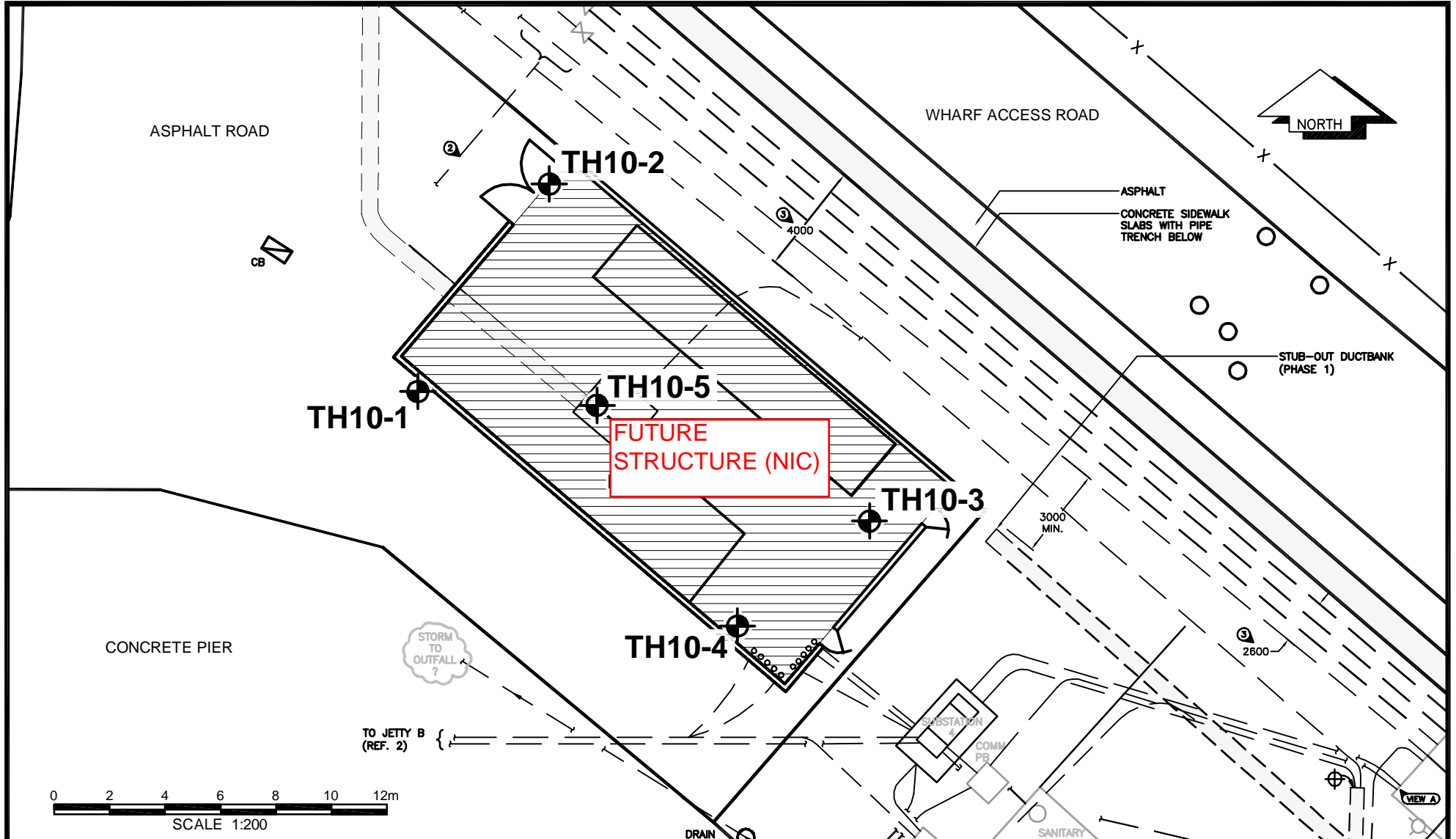


DATE: 2010-Feb-25

FILE NO.: 19-5308-22

DEPTH (m)	PENETRATION (blows/300 mm)	WATER CONTENT (%) ○ Disturbed ● Undisturbed	WATER LEVEL ▼ Plastic Limit Liquid Limit	SAMPLES ■ Disturbed ■ Undisturbed ⊠ No Recovery	UNDRAINED SHEAR STRENGTH (kPa) ◆ Peak ◇ Residual	GRAIN SIZE (%) ▲ Passing #200 sieve △ Passing #4 sieve	SOIL HEADSPACE READING (ppm) ■ GASTECH reading ⊞ PID reading ⊕ CPen reading	DEPTH (m)
0								Asphalt Pavement (75 mm thick)
0								Moist, brown, gravelly SAND (FILL); SA-SR gravel to 30 mm diameter
1								Firm to stiff, moist, brown, silty CLAY (FILL); low plastic, trace to some sand, trace shell fragments.
1								- organic silt seam from 0.7 m to 0.8 m depth
2								Wet, brown, clayey SAND (possible FILL); fine and coarse grained, some silt.
2								
3								End of Auger Hole at 3.0 m depth.
3								
4								
4								
5								
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10								

LOG OF TEST HOLE (NO EST.) BRW_19-5308-22_IOS BUILDING 2010 LOGS.GPJ THURBER BC.GDT 3/10/10- THURBER VICTORIA MAY 2007.GLB

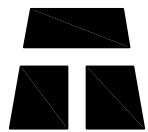


NOTES:

1. Test Holes were located by measuring from existing site features; locations are approximate only.
2. Base plan provided by client.

DESIGNED	BRW
DRAWN	RRS
DATE	MARCH 8, 2010
APPROVED	<i>BRW.</i>
SCALE	1:200

GENIVAR CONSULTANTS LTD.	
TEST HOLE LOCATION PLAN	
IOS NEW SUBSTATION 34 BUILDING GEOTECHNICAL INVESTIGATION	NORTH SAANICH, B.C.

 THURBER
DWG. NO. 19-5308-22-1

APPROXIMATE
EXTENT OF
TRENCHING





THURBER ENGINEERING LTD.

MEMORANDUM No. 1

To: Bryan Gallagher, P.Eng.
Stantec

Date: March 18, 2016

From: Brian Webster, B.Eng., P.Eng.

File: 11977

Review: Kevin Sterne, M.Sc., P.Eng.

Cc: Malcolm Brown, Stantec

INSTITUTE OF OCEAN SCIENCES MARINE SIDE ELECTRICAL UPGRADE RESPONSE TO DESIGN QUESTIONS

Dear Bryan:

This memorandum provides clarification of recommendations provided in our geotechnical assessment report dated March 10, 2016 in response to questions raised by Stantec during our telephone conversations on March 14 and 15, 2016.

It is a condition of this memorandum that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

1. GEOTECHNICAL COMMENTS

This memorandum should be read in conjunction with our geotechnical assessment report dated March 10, 2016.

1.1 Potentially Liquefiable Soil

Our report comments on a 600 mm thick layer of wet, compact silty sand that was encountered at a depth of 4.0 m in TH10-1. This layer could be potentially liquefiable during a design seismic event. There is limited geotechnical information available as to the extent of potentially liquefiable soils at the proposed building site. Due to the presence of potentially liquefiable soils, the Substation Building site should be classified as Site Class F. Prior to liquefaction of the soils, the building site can be considered as Site Class D for seismic design.

As there is limited information available regarding the lateral and vertical extents of potentially liquefiable soils, additional investigation and analysis would be required to delineate the potentially liquefiable zones and assess the potentially effect on the building. Based on the thickness of potentially liquefiable soil at TH10-1, we anticipate that vertical settlement would be manageable. It should be noted that an assessment of lateral deformations associated with liquefaction would require assessment of the soils between the proposed substation and the foreshore. If lateral deformations are an issue, it would affect other foundations in the area and not just the substation.



1.2 Site Preparation

The foundation design and site development recommendations provided in Section 4.2 of our report are still applicable. As noted above in Section 1.1, additional investigation and analysis would be required to characterize the liquefaction hazard at the site and its potential impact on the building.

1.3 Foundations

We understand that a raft slab foundation is currently being considered for support of the Substation Building. As noted in the geotechnical report, this is the preferred support system to accommodate possible deformations should localized liquefaction occur beneath the building. Additional information such as modulus of subgrade reaction can be provided upon request.

2. FURTHER WORK

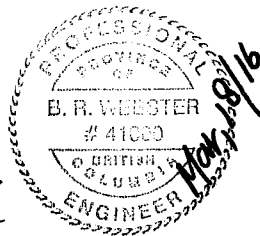
The subsurface conditions at this site are variable. Additional geotechnical investigation would need to be carried out to further assess liquefaction potential at the proposed Substation Building site.

3. CLOSURE

We trust this memorandum provides the information you require at this time. If you have any questions, please contact us.

Yours truly,
Thurber Engineering Ltd.
Kevin Sterne, M.Sc., P.Eng.
Review Engineer

Brian Webster, B.Eng., P.Eng.
Geotechnical Engineer





STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

PROJECT NO. 9R306-2
IOS – TIMBER AND CONCRETE FLOATS A, B, C & D
FISHERIES AND OCEANS CANADA
SIDNEY, BC

Appendix B
THURBER
GEOTECHNICAL ASSESSMENT
Page 24 of 24

END OF APPENDIX B

PROJECT NO. 9R306-2
IOS – TIMBER AND CONCRETE FLOATS A, B, C & D
FISHERIES AND OCEANS CANADA
SIDNEY, BC

Appendix C
PRELIMINARY
HAZARD ASSESSMENT FORM
Page 1 of 5

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PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	9R306-2 Timber & Concrete Floats A, B, C & D		
Location:	Institute of Ocean Sciences, Sidney, B.C.		
Date:	July 15, 2016		
Name of Departmental Representative:	Jerry Chen		
Name of Client:	Fisheries and Oceans Canada		
Name of Client Project Coordinator	Michael Liang	Telephone: (604) 666-6491	

Site Specific Orientation Provided at Project Location Yes

Notice of Project Required Yes

NOTE:

PWGSC requires “**A Notice of Project**” for all construction work related activities.

NOTE:

OHS law is made up of many municipal, provincial, and federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

Important Notice: This hazard assessment has been prepared by PWGSC for its own project planning process, and to inform the service provider of actual and potential hazards that may be encountered in performance of the work. PWGSC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the service provider.

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
	PWGSC, OGD's, or tenants		General Public or other contractors		
Examples: Chemical, Biological, Natural, Physical, and Ergonomic					Note: When thinking about this pre-construction hazard assessment, remember a hazard is anything that may cause harm, such as chemicals, electricity, working from heights, etc; the risk is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.
Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.	Yes	No	Yes	No	

Typical Construction Hazards					
Concealed/Buried Services (electrical,gas, water, sewer etc)					
Slip Hazards or Unsound Footing					
Working at Heights					
Working Over or Around Water					
Heavy overhead lifting operations, mobile cranes etc.					
Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.					
Fire and Explosion Hazards					
High Noise Levels					
Excavations					



Blasting					
Construction Equipment					
Pedestrian Traffic (site personnel, tenants, visitors, public)					
Multiple Employer Worksite	yes				Example: Contractor working in a occupied Federal Employee space.

Electrical Hazards					Comments
Contact With Overhead Wires					
Live Electrical Systems or Equipment					Lock our procedures are required.
Other:					
Physical Hazards					
Equipment Slippage Due To Slopes/Ground Conditions					
Earthquake	yes				
Tsunami	yes				
Avalanche		no			
Forest Fires	yes				
Fire and Explosion Hazards	yes				
Working in Isolation					
Working Alone					
Violence in the Workplace	yes				
High Noise Levels					
Inclement weather	yes				
High Pressure Systems					
Other:					
Hazardous Work Environments					
Confined Spaces / Restricted Spaces					
Suspended / Mobile Work Platforms					
Other:					
Biological Hazards					
Mould Proliferations					
Accumulation of Bird or Bat Guano					
Bacteria / Legionella in Cooling Towers / Process Water					
Rodent / Insect Infestation					
Poisonous Plants					
Sharp or Potentially Infectious Objects in Wastes					
Wildlife					
Chemical Hazards					
Asbestos Materials on Site					If "yes" a pre-project asbestos survey report is required. Provide Contractor ELF Form 16 "Contractor Notification and Acknowledgement"
Designated Substance Present					If "yes" a pre-project designated substance survey report is required.
Chemicals Used in work					Provide Current Canadian MSDS Sheets
Lead in paint					If "yes" a pre-project lead survey report is required.



Mercury in Thermostats or Switches					If "yes" a pre-project mercury survey report is required.
Application of Chemicals or Pesticides					
PCB Liquids in Electrical Equipment					
Radioactive Materials in Equipment					
Other:					
Contaminated Sites Hazards					
Hazardous Waste					
Hydrocarbons					
Metals					
Other:					

Security Hazards					Comments
Risk of Assault					
Other:					
Other Hazards					
Silica dust from drilling					

Other Compliance and Permit Requirements ¹	YES	NO	Notes / Comments ²
Is a Building Permit required.			
Is a Electrical permit required.			
Is a Plumbing Permit required.			
Is a Sewage Permit required.		no	
Is a Dumping Permit required.			
Is a Hot Work Permit required.	yes		
Is a Permit to Work required.		no	Mandatory for ALL AFD managed work sites.
Is a Confined Space Entry Permit required.			Mandatory
Is a Confined Space Entry Log required			Mandatory for all Confined Spaces

Notes:

- (1) Does not relieve Service Provider from complying with all applicable federal, provincial, and municipal laws and regulations.
- (2) TBD means To Be Determined by Service Provider.

Service Provider Acknowledgement: We confirm receipt and review of this Pre-Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary protective measures (which may exceed those cited herein) for performance of the work.			
Service Provider Name			
Signatory for Service Provider		Date Signed	
RETURN EXECUTED DOCUMENT TO PWGSC DEPARTMENTAL REPRESENTATIVE PRIOR TO ANY WORK COMMENCING			

PROJECT NO. 9R306-2
IOS – TIMBER AND CONCRETE FLOATS A, B, C & D
FISHERIES AND OCEANS CANADA
SIDNEY, BC

Appendix C
PRELIMINARY
HAZARD ASSESSMENT FORM
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END OF APPENDIX C