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## **Small Craft Harbours Branch**

**DEEP BAY, BC**

**DEEP BAY CAUSEWAY SURFACING AND ELECTRICAL SUPPLY**

**JULY 2018**

FISHERIES AND OCEANS CANADA  
SMALL CRAFT HARBOURS – PACIFIC REGION

200 – 401 Burrard Street  
Vancouver, British Columbia  
V6C 3S4

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## Section 01 00 00 – SUMMARY OF WORK

### Part 1 General

#### 1.1 RELATED REQUIREMENTS

- .1 General Conditions and related contract documents form an integral part of this section.

#### 1.2 DEFINITIONS

- .1 Throughout contract documents, the words “Site,” “Owner,” “Contracting Authority,” “Harbour Authority,” “Contractor,” “Engineer,” or “Department,” shall be defined as follows:
  - .1 Site  
“Site” referred to herein is Deep Bay Small Craft Harbour, 180 Burne Road Bowser, BC, V0R 1G0, Canada.
  - .2 Contracting Authority  
“Contracting Authority” referred to herein is Public Works and Government Services Canada (PWGSC).
  - .3 Owner  
“Owner” referred to herein is the Department of Fisheries and Oceans Canada – Small Craft Harbours, Suite 200-401 Burrard Street, Vancouver, BC V6C 3S4.
  - .4 Engineer/Departmental Representative  
“Engineer/Departmental Representative” referred to herein is commonly an employee of the Owner assigned by the Owner as the Engineer and Technical Authority for the project. The Engineer may be a sub-contract Engineer for technical and inspection purposes and the Technical Authority must still be an employee of the Owner.
  - .5 Contractor  
“Contractor” referred to herein is the party accepted by the Owner, with whom a formal contract is signed, to complete the work of this project.
  - .6 Department  
The Department of Fisheries and Oceans, Canada.
  - .7 The words **feed, feeder, conduit/cable** and their derivatives shall be taken to mean the conduit and cable system complete with all necessary fittings, boxes, seismic attachments, fastenings, grounding and bonding requirements, roofing penetration requirements, fire ratings, and fire-

stopping approved and rated for continuous use in the electrical system as described in the project.

- .8 The words ***Transformer Receptacle Cabinet*** or ***TRC*** and/or ***pedestal*** or ***kiosk*** and their derivatives shall be taken to mean a complete cabinet including its transformer, panels, receptacles, luminaire, fixture, and all conduit, wiring, cabling, fasteners, fittings, attachments and labels.
- .9 The words ***Receptacle Cabinet*** or ***RC*** and/or ***pedestal*** or ***kiosk*** and their derivatives shall be taken to mean the complete cabinet including its panel, receptacles, luminaire, fixture, and all conduit, wiring, cabling, fasteners, fittings, attachments and labels.

### 1.3 LOCATION

- .1 Deep Bay Small Craft Harbour (the Project Site) is located in Bowser, British Columbia, between Qualicum Beach and Fanny Bay on Vancouver Island.
- .2 Project Site address is referenced in Section 1.2.1.1.

### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The work under this contract shall include the supply of equipment, labour and materials for the performance of all work as required by the Contract Documents. All replaced items, cut-offs and waste material shall be disposed by the contractor in strict accordance with provincial, local, and municipal regulations and Part 8 of the National Building Code and with the Canadian Construction Safety Code.
- .2 The work generally consists of, but is not limited to the following items:
  - .1 Mobilisation/Demobilisation
  - .2 Supply and Install of Conduit, Powerpole and Waterlines
  - .3 Supply and Install of Road Base and Asphalt
  - .4 Supply and Install of Curbs, Planters and Handrail
  - .5 Supply and Install of Electrical System
- .3 The work shall be completed no later than December 21, 2018.
- .4 Notwithstanding the scope of work stated within the drawings and all sections of this contract, the contractor is not exempt from and is fully responsible for details omitted or forgotten that contribute to the safe preparation, execution and

completion of the Work to a fully functioning, safe, and permanently operational marina electrical system & resurfaced causeway.

.5 The following materials shall be supplied by the Owner to the Site.

- .1 3C 4/o Tech Cable, QTY: 300 m
- .2 Cable Tray & Hangers, QTY: 20 units @3m long

## 1.5 SCHEDULE OF QUANTITIES AND PRICES

.1 The work generally consists of, but is not limited to the following items as outlined in Section 01 10 00 SCHEDULE OF QUANTITIES AND PRICES:

### .1 Mobilization/Demobilization

The lump sum cost for this item shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 Moving all required crew, equipment and work materials to the Project Site with the exception of the following materials:
  - .1 Owner Supplied materials identified in Section 1.4.5.
  - .2 Receive and assume responsibility for all Owner Supplied materials identified in 1.4.5.
  - .3 Contractor is responsible for confirming that all Owner supplied materials have been received.
  - .4 Site clean-up consisting of the following:
    - .1 Any upland areas used for storage/staging of materials have been reinstated to their original condition that existed prior to mobilization.
    - .2 All work areas clear of debris, false work and other work materials.
  - .5 Any overhead costs not identified in other items.

### .2 Supply and Installation of Powerpole, Conduit & Waterlines

The lump sum cost for this item shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 Powerpole: Supply and install of new powerpole as per Drawing C01, Drawing E000 & E005:

- .1 Planned pole location to be identified by contractor for verification by Owner, in advance of installation and pullboxes.
- .2 Electrical Conduit: Supply and install electrical conduits as per Section 26 05 34 and as per Drawings E000, E004, C01 and follows:
  - .1 Conduit and pullboxes locations dimensions identified on drawings.
  - .2 Planned conduit positions to be identified for verification by Engineer prior to excavation.
- .3 Waterlines: Supply and install of waterlines as per Drawing C01 and including the following:
  - .1 Supply and install one (1) 25mm polyethylene (PE) irrigation waterline.
  - .2 Connect 25 PE irrigation line to existing water service and terminate in irrigation box with double backflow preventer.
  - .3 Additional waterline details identified on drawings
  - .4 Planned waterline position to be identified for verification by Engineer prior to excavation.

.3 Supply And Placement of Road Base & Asphalt

The lump sum cost for this item shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 Roadbase: Supply and placement of roadbase as per Drawing C01 and as specified in Section 32 11 23:
  - .1 Roadbase material to be placed with a grading and thickness as shown in Drawing C01.
- .2 Asphalt: Supply and placement of asphalt as per Drawing C01 and as specified in Section 32 12 16:
  - .1 Asphalt thickness and grading must in accordance with Drawing C01.

- .2 Asphalt surfacing to be inspected for acceptance by an Engineer, on-site, within 5 calendar days of completion.

.4 Supply and Install Curbs, Planters & Handrail

The lump sum cost for this item shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 All curbs, planters and handrails to be supplied and installed as per Drawing C01.
- .2 All precast concrete planter boxes to be MacKay barrier rectangular planter 78”L x 28”W x 30”H.

.5 Supply and Install Electrical System

The lump sum cost for this item shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 Supply and install new MDP-1, and Private MDP enclosure, new distribution equipment and feeders, and connect new feeder cables from MDP-1 to MDP-2 located on the wharf and provide feeders cable from private MDP enclosure to the private wharf junction box as per Drawing E000, E004, E007.
- .2 The existing in-service 3-phase supply and distribution system is to remain in operation until the 600V distribution system is constructed and ready to be energized.
- .3 Contractor is responsible for providing any temporary power if required by the Owner.
  - .1 Shutdowns may be required when installing the 3-phase electrical equipment on the floats due to the proximity of the existing 1-phase energized equipment.
- .4 Refer to Section 26 05 01, 26 24 16 and 26 27 17.01.
- .5 Shutdown work: for all shutdown work, the contractor shall assign a “Person-in-Charge (PIC)” for the shutdown:
  - .1 The PIC shall hold a Safety meeting immediately prior to scheduled Shutdown and obtain signatures of those present.
  - .2 The PIC shall be on site at the scene of the work during the entire shutdown and shall be the focal point for communications among the Owner, the Engineer, the

- Contractor, Subcontractors, BC Hydro, other Contractors on site, and other AHJs.
- .3 The PIC shall explain the work to be executed to all present including other Contractors on site, and ensure all safety procedures are followed by those working on-site including lock & tag-out procedures.
  - .4 Only those present and signed-in during the safety meeting shall be allowed in the vicinity of the shutdown work to be executed;
  - .5 The signed safety meeting agenda shall be submitted to the Owner and Engineer prior to the shutdown being executed.
  - .6 Existing Services:
    - .1 Notify Owner, Engineer and utility companies of intended interruption of services and obtain required permission.
    - .2 Where Work involves breaking into or connecting to existing services, provide 5 working-days-notice to Owner and Engineer for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to Owner operations.
    - .3 Where Work impacts existing entrance and egress routes, provide alternative routes for personnel, pedestrian and vehicular traffic.
    - .4 Establish location and extent of service lines in area of work before starting Work. Notify Owner and Engineer of findings.
    - .5 Submit schedule to and obtain approval from Owner and Engineer for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
    - .6 Provide temporary services as directed by Owner and Engineer to maintain critical building and marina systems.
    - .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic. Provide safety

barricades as necessary to prevent public from access to areas under construction.

- .8 Where unknown services are encountered, immediately advise client and engineer and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by the AHJ.

## **1.6 WORK SEQUENCE AND OWNER OCCUPANCY**

- .1 Contractor to provide a detailed cost breakdown within 14 calendar days of award with reference to work items listed in Section 1.5.1.
- .2 Contractor to include allowance for an on-site pre-construction meeting
- .3 Contractor to provide a construction schedule within 7 calendar days of award including the following milestones:
  - .1 Pre-Construction Meeting
  - .2 Mobilisation Date(s)
  - .3 Installation of Powerpole and Anchoring
  - .4 Placement of Aggregate/Concrete
  - .5 Paving
  - .6 Electrical Enclosure Fabrication
  - .7 Electrical Installation
  - .8 Supply And Installation of Curbs
  - .9 Demobilization
- .4 Shutdowns shall require the authorization of the Owner and shall be scheduled 5 working days in advance with the Owner. The Owner reserves the right to re-schedule shutdowns at any time due to their operations.

## **1.7 CONTRACTOR USE OF PREMISES**

- .1 Co-ordinate use of premises under direction of Owner.

- .2 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .3 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Engineer.
- .4 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

## **1.8 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy of each document as follows:
  - .1 Contract Drawings, Specifications and any Addenda.
  - .2 Reviewed Shop Drawings
  - .3 Change Orders and other modifications to Contract.
  - .4 Copy of Approved Work Schedule.
  - .5 Field Test Reports.
  - .6 Health and Safety Plan and other safety related documents.
  - .7 All regulatory permits required for the work.
  - .8 Associated Best Management Practices documentation.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not used.

## **Part 3 Execution**

### **3.1 CONSTRUCTION TIME, SEQUENCE AND PERFORMANCE**

- .1 During Work maintain fire extinguisher and fire hose bib connections access/control. Notify the Owner of all Work that impacts the access or operation of the existing fire system.

### **3.2 WORK BY OTHERS**

- .1 Cooperate and coordinate Work with that of other Contractors on-site. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Owner and Engineer in writing, any defects which may interfere with proper execution of Work.

- .2 Work of Project executed prior to start of, or during the Work of this Contract, and which is specifically excluded from this Contract.
  - .1 BC Hydro extension of 25kV overhead lines, provision of BC Hydro pole, provision of BC Hydro polemount transformers: provision of BC Hydro secondary cables to DFO demarcation point.

**END OF SECTION**

## **Section 01 01 00 – GENERAL REQUIREMENTS**

### **Part 1 General**

#### **1.1 RELATED REQUIREMENTS**

- .1 General Conditions and related contract documents form an integral part of this section.

#### **1.2 INSPECTION OF SITE**

- .1 It is the responsibility of each bidder to obtain all necessary information pertaining to local site conditions and existing works, beyond the information provided in this Specification and accompanying drawing(s).

#### **1.3 PERMITS, CERTIFICATED, LAWS AND ORDINANCES**

- .1 The Contractor must, at his own expense, procure all permits, certificates and licenses required of him by law for the execution of his work under this contract. He shall comply with all Federal, Provincial or Municipal laws, ordinances or rules and regulations relating to the performance of his work and in force during the duration of this contract.
- .2 The Contractor is required to give all required notices, comply with all local, municipal, provincial, and federal laws, ordinances, codes, by-laws, rules and regulations relating to the work.
- .3 All work to be done in accordance with Work Safe BC regulations.
- .4 The Contractor shall comply with Federal and Provincial laws, orders and regulations concerning the control and abatement of water and air pollution.
- .5 The Contractor shall comply with the requirements of any local or other Noise by-laws.

#### **1.4 MINIMUM STANDARDS**

- .1 In the absence of other standards specified in the Contract Documents, all work is to conform to, or exceed, the minimum standards of the Canadian Government Specifications Boards, the Canadian Standards Association, the American Society for Testing of Materials, or the National Building Code of Canada, whichever is applicable.
- .2 All work to be done in accordance with Work Safe BC regulations.

#### **1.5 INTERFERENCE WITH OPERATION**

- .1 The Contractor shall obey all navigation regulations and conduct operations so as to interfere as little as possible with the use of berthing spaces, fairways and passages. Install and maintain any and all protection to navigation as may be required by any properly constituted authority or by the Engineer. During the course of construction and clean up, do not dispose of surplus, waste or demolished materials in navigable waters.
- .2 The Contractor shall upon instruction of the Owner or Engineer, promptly remove any of the Contractor's equipment located outside the specified work area and obstructing any harbour operation.

## **1.6 COMPLIANCE WITH STANDARD SPECIFICATIONS CODES AND REGULATIONS**

- .1 Unless expressly stated to the contrary, all materials, equipment and articles furnished by the Contractor shall comply with the applicable provisions of the standards of the Canadian Standards Association (CSA) or the Canadian Government Specification Board (CGSB) with the applicable provisions of the American Society for Testing Materials (ASTM), National Fire Protection Association (NFPA), American Concrete Institute (ACI) and the American Water Works Association (AWWA).
- .2 Perform work in accordance with:
  - .1 Canada Labour Code, Canada Occupational Safety and Health Regulations.
  - .2 Fire Commissioner of Canada (FCC):
    - .1 FCC No. 301-1982, Standard for Construction Operations.
    - .2 FCC No. 302-1982, Standard for Welding and Cutting.
  - .3 National Research Council (NRC):
    - .1 National Building Code of Canada (NBC) 2015.
  - .4 Province of British Columbia:
    - .1 Workers Compensation Act (Occupational Health and Safety), Amendment Act, B.C. Reg. 185/99, herein referred to as the Workers Compensation Act (WCA).
  - .5 CSA C22.1-15 Canadian Electrical Code.
- .3 If there is a conflict between codes or standards the more stringent requirement shall apply.
- .4 The Contractor shall follow all regulations in accordance with the Fisheries Act. Care shall be taken not to release any deleterious materials to fish habitat into the water.

## **1.7 CONTRACTOR'S PERSONNEL**

- .1 The Contractor's representative on site shall be completely familiar with the method of work to be employed. Such personnel shall remain on site for the duration of the work.

## **1.8 RESPONSIBILITY TO PERSONNEL**

- .1 The Contractor shall have full responsibility for the board, lodging and transportation of his personnel and subcontractors. The cost for this shall be incorporated into his unit prices. He shall comply with all labor requirements, and Worker's Compensation regulations.

#### **1.9 BARRIERS, LIGHTS AND WATCHING**

- .1 The Contractor shall provide all requisite barriers, fences, warning signs, lights and watching for the protection of persons and property on or adjacent to the site.

#### **1.10 PROGRESS REPORT**

- .1 The Contractor shall keep a daily record of progress of the work available for inspection by the Engineer.
- .2 The daily record shall include particulars of weather conditions, number of workers, plant and equipment working and work performed.

#### **1.11 ENGINEER'S ACCESS**

- .1 The Contractor shall provide access to the work for the Engineer's inspectors and surveyors as required.

#### **1.12 PERMITS AND ROYALTIES**

- .1 Permits and licenses required for the Contractors work are the responsibility of the Contractor and shall be for the Contractor's account. The Contractor shall have the appropriate business license.

#### **1.13 PROTECTION OF EXISTING STRUCTURES**

- .1 Existing structures, adjacent marine facilities, roads, services, piping or equipment within the work area which are not to be replaced shall be properly protected from any injury or damage, direct or indirect. Any damage that is caused as a result of the operations of the Contractor shall be repaired and made good at the Contractor's expense to the satisfaction of the Engineer.

#### **1.14 EXISTING SERVICES**

- .1 Notify Owner, Engineer and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, provide 5 working days' notice to Owner and Engineer for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of

- interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to Owner operations.
- .3 Where Work impacts existing entrance and egress routes, provide alternative routes for personnel, pedestrian and vehicular traffic.
  - .4 Establish location and extent of service lines in area of work before starting Work. Notify Owner and Engineer of findings.
  - .5 Submit schedule to and obtain approval from Owner and Engineer for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
  - .6 Provide temporary services as directed by Owner and Engineer to maintain critical building and marina systems.
  - .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic. Provide safety barricades as necessary to prevent public from access to areas under construction.
  - .8 Where unknown services are encountered, immediately advise client and engineer and confirm findings in writing.
  - .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by the AHJ.

#### **1.15 WEATHER**

- .1 No work shall be undertaken by the Contractor when, in the opinion of the Engineer, the weather is unsuitable or unfavourable for a particular class of work.
- .2 The Contractor is expected to be familiar with the site including current and historical weather conditions and is to make allowances as necessary in order to complete the work as specified during the indicated work dates.
- .3 No allowance will be made for delay of work over and above the date of completion specified in the contract agreement on account of weather conditions that could have been reasonably predicted from a historical knowledge of site conditions.

#### **1.16 SOIL DATA AND EXISTING TOPOGRAPHY**

- .1 The Contractor shall notify the Engineer of any subsurface conditions at the place of the work that may differ materially from those indicated in the Contract Documents.

#### **1.17 LOCATION OF EQUIPMENT AND FIXTURES**

- .1 Locations of equipment, fixtures, and outlet equipment as indicated or specified are to be as shown. If not detailed, locations are approximate.

- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with the manufacturer & owner's recommendations for safety, access and maintenance.
- .3 Inform Engineer and owner of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate position of various services and equipment when required by Engineer.

#### **1.18 UTILITIES AND SERVICES**

- .1 The Contractor shall be responsible for any damage to overhead, underwater and/or underground utilities and/or services caused by the Contractor's operations and shall repair and make good the repairs at the Contractor's own expense.
- .2 The Contractor shall be responsible, unless otherwise agreed to by the Engineer, for all temporary or construction services and utilities, and first aid facilities.

#### **1.19 MATERIAL HANDLING AND STORAGE**

- .1 Any materials damaged by the Contractor during handling, transportation and storage shall be replaced at the Contractor's expense.
- .2 Delivery and storage:
  - .1 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.
  - .2 Prevent damage, adulteration, and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.
  - .3 Store material and equipment in accordance with suppliers' instructions.
  - .4 Touch-up damaged factory finished surfaces to Engineer's satisfaction. Use primer or enamel to match original. Do not paint over nameplates.

#### **1.20 MATERIALS AND EQUIPMENT SUPPLIED BY THE CONTRACTOR**

- .1 The Contractor shall supply all labor, hand tools, power tools, generators, equipment and all other materials required to complete this Contract.
- .2 Use new material and equipment unless otherwise specified.
- .3 Within 7 days of Engineer's written request, submit the following information for any or all materials and products proposed for supply:

- .1 Name and address of manufacturer.
- .2 Trade name, model and catalogue number.
- .3 Performance, descriptive and test data.
- .4 Manufacturer's installation or application instructions.
- .5 Evidence of arrangements to procure.
- .4 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
- .5 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
- .6 Contractor's options for selection of materials for tendering:
  - .1 Materials specified by "**Prescriptive**" or "**Performance**" specifications: select any material meeting or exceeding specifications.
  - .2 Materials specified by **referenced standard**: select any material meeting or exceeding the specified standard.
  - .3 Materials specified to be listed on the **CGSB Qualified Products List**: select any listed manufacturer.
  - .4 Materials specified to meet particular design requirements or to match the existing materials: use only material specified as "**Approved Material**".
    - .1 Alternative materials may be considered provided full technical data is received in writing by the Engineer in accordance with "SPECIAL INSTRUCTIONS TO TENDERERS".
    - .2 If alternative materials are approved, an addendum to the tender documents will be issued.
  - .5 Materials specified under "**Acceptable Materials**": select any 1 of the indicated manufacturers, or any other manufacturer meeting or exceeding Prescriptive specifications.
  - .4 When materials are specified by a **referenced standard** or by **Prescriptive** or **Performance** specifications, upon request of Engineer obtain from manufacturer a report from an independent laboratory showing that the material or equipment meets or exceeds the specified requirements.
- .7 Substitution after Contract award:

- .1 No substitutions will be permitted without prior written approval of the Engineer.
- .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 Engineer 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 Engineer as equivalent to the material specified, and will result in a credit to the Contract amount.
- .4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the project. Pay for design or drawing changes required as result of substitution.**
- .5 Amounts of all credits arising from approval of substitutions will be determined by the Engineer, and the Contract price will be reduced accordingly.
- .8 Manufacturer's instructions:
  - .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
  - .2 Notify Engineer in writing of any conflict between these specifications and manufacturer's instructions. Engineer will designate which document is to be followed.
- .9 Fastenings, general:
  - .1 Provide metal fastenings and accessories in same texture, colour, and finish as base metal in which they occur. **Prevent electrolytic action between dissimilar metals.** Use non-corrosive fasteners, anchors, and spacers for securing exterior work.
  - .2 Space anchors within limits of load bearing or shear capacity; ensure they provide positive permanent anchorage. Wood plugs are not acceptable.
  - .3 Keep exposed fastenings to a minimum. Space evenly and lay out neatly.

- .4 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
- .10 Fastenings, equipment:
  - .1 Use fastenings of standard commercial sizes and patterns with material and finish **suitable for service in a marine environment**.
  - .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel or hot dip galvanized for exterior areas.
  - .3 Bolts may not project more than 1 diameter beyond nuts.

### 1.21 CONSTRUCTION WORK SCHEDULE

- .1 The Contractor shall work whatever shifts required in order to ensure the work meets regulatory windows and is completed as outlined in the agreed work plan.
- .2 The Contractor shall normally perform all work within the hours of daylight except in instances where the Contractor has requested and received approval for shift changes from the Owner.
- .3 Within 7 days of award the Contractor is to supply a week by week schedule of proposed activities related to the contract at the request of the Engineer.
- .4 The Contractor must notify the Owner immediately whenever a variation from the construction schedule is expected to occur or when the submission of the submittals will be delayed.

### 1.22 SETTING OUT OF WORK

- .1 The Contractor is expected to familiarize themselves with the Site, facilities and amenities within.
- .2 The Contractor shall not enter on nor occupy with men, tools, equipment or material, any ground outside the property of the Harbour Authority without the written consent of the party owning such ground. Other Contractors or employees or representatives of the Department may, for all necessary purposes, enter upon the work and premises used by the Contractor, and the Contractor shall conduct his work so as not to impede unnecessarily any work being done by others nor adjacent to the Site.

### 1.23 AS-BUILT DRAWINGS

- .1 As work progresses, maintain accurate records to show all deviations from the Contract Drawings. Note on as-built drawings as changes occur, and, at completion, supply one (1) set of all drawings and specifications with all deviations clearly marked.

#### **1.24 SITE SECURITY**

- .1 The Contractor is responsible for all materials and equipment either supplied by the Contractor, the Client Department, or the Owner. The Contractor is responsible for the repair and replacement of stolen or damaged items.

#### **1.25 CO-OPERATION WITH HARBOUR AUTHORITY**

- .1 The Contractor will give the Owner and Harbour Authority a minimum 72-hours-notice for work that may interrupt pedestrian access to the harbour.
- .2 The site shall be left in a safe condition at the completion of each work day.

#### **1.26 CONDITION OF STRUCTURE**

- .1 Existing structures, adjacent marine facilities, roads, and all other structures, services, piping or equipment within the work area shall be properly protected from any injury or damage, direct or indirect. Any damage that is caused as a result of the operations of the Contractor shall be repaired and made good at the Contractors expense to the satisfaction of the Owner.

#### **1.25 INSPECTION OF STRUCTURE**

- .1 The Owner or inspector shall inspect the completed works. The Contractor shall be responsible for the costs of any re-inspections that may be required due to errors or omissions of the Contractor.

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not used.

### **Part 3 Execution**

#### **3.1 SITE ACCESS**

- .1 The Contractor shall provide access to the work for the Owner's inspectors and surveyors as required.
- .2 General site access shall be coordinated with the Owner.

- .3 The Contractor shall maintain routes of travel, with the Owner being the sole judge as to what may be deemed reasonable.
- .4 The Contractor shall erect and maintain barriers, fences, lights, warning devices, and other protective devices as may be required for prevention of theft or damage of goods and protection of the public and workmen, or if so ordered by the Owner.

### **3.2 CONSTRUCTION AREA**

- .1 The Contractor shall regulate construction traffic on public areas and comply with all local ordinances in connection therewith, including load limitation and removal of debris.
- .2 The Contractor shall confine his operations on the Site to those areas actually required for the work including routes and regulations approved by the Owner for haulage of materials.

### **3.3 SAFETY REGULATIONS AND MEASURES**

- .1 Construction safety:
  - .1 Observe and enforce construction safety measures required by the following:
    - .1 NBC 2015, Part 8 - Safety Measures at Construction and Demolition Sites.
    - .2 B.C. Provincial Government.
    - .3 Workers' Compensation Board of B.C.
    - .4 Municipal statutes and authorities.
  - .2 In event of conflict between any provisions of the above authorities, the most stringent provision will apply.
  - .3 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.
- .2 Workers' Compensation Board 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 Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Final Certificate of Completion is signed.

.3 Compliance with regulations:

- .1 Small Craft Harbours may terminate the Contract without liability to SCH where the Contractor, in the opinion of SCH, refuses to comply with a requirement of the Workers' Compensation Act or the 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 the Workers' Compensation Act or the Occupational Health and Safety codes, standards and regulations.

.4 Electrical safety requirements:

- .1 Comply with local 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.
- .2 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with the Engineer.
- .3 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.

.5 Electrical lock-out:

- .1 Develop, implement and enforce use of established procedures to provide electrical lock-out 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 lock-out procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have the procedures available for review upon request by Engineer.
- .3 Keep documents and lock-out tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by the Engineer or by any authorized safety representative.

### **3.4 NIGHT WORK**

- .1 The Contractor shall keep proper lights each night between the hours of sunset and sunrise upon all floating plant and false-work, upon all ranges and other stakes where necessary, and upon all buoys of such size and in such locations as required by a governing authority. When work is done at night, maintain from sunset to sunrise such lights on or about the work and plant as necessary for the proper observation of the work and the efficient prosecution thereof.

### **3.5 CLEAN-UP**

- .1 At all times the Contractor shall keep the site free from accumulation of waste material and debris and leave the site clean and tidy on completion.

### **3.6 CONCEALMENT**

- .1 Conceal pipes, ducts, cables, and wiring in construction of finished areas and floats except where indicated otherwise.

### **3.7 CUTTING, FITTING AND PATCHING**

- .1 Execute cutting (including excavation), fitting, and patching required to make work fit properly together.
- .2 Where new work connects with existing and where existing work is altered, cut, patch, and make good to match existing work.
- .3 Obtain Engineer's approval before cutting.
- .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .5 Where work requires the removal and replacement of timbers, including decking, do not cut timbers. Remove fasteners separately and remove and replace timbers as existing.

### **3.8 EXISTING CONNECTING SERVICES**

- .1 Where work involve breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to pedestrian and vehicular traffic.
- .2 Before starting work, establish location and extent of service lines in areas of work and notify Engineer of findings.
- .3 Submit schedule to and obtain approval from Engineer for any shutdown or closure of active service or facility. Adhere to the approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.
- .5 Remove abandoned service lines. Cap or otherwise seal lines at cut off points as directed by Engineer.
- .6 Record locations of maintained, re-routed and abandoned service lines.

### **3.9 TEMPORARY SERVICES**

- .1 On site the Contractor shall make his own arrangements for supply of water and electricity.
- .2 The Contractor shall supply for his own use: sanitary, first aid, and all other temporary services and facilities required for the work.

### **3.10 CARE OF FINISHED WORK**

- .1 The Contractor shall protect all finished work from injury, defacement, unauthorized entry, or trespass until such time as the work described in the Contract Documents is substantially complete.

### **3.11 DISPOSAL**

- .1 All demolition to be performed as per Section 00 20 60 – Demolition of Structures.
- .2 All materials designated to be replaced or removed will become the property of the Contractor and will be disposed of in an environmentally acceptable manner so that they neither become a menace to marine navigation nor a nuisance to the public on adjacent or any other property.
- .3 All replaced items, cut-offs and waste materials shall be disposed by the Contractor in strict accordance with provincial, local, and municipal regulations and Part 8 of the National Building Code and with the Canadian Construction Safety Code.

### **3.12 SITEWORK**

- .1 All work shall be completed as per direction of Engineer or Owner.
- .2 All heavy construction equipment shall be free of leaks and cleaned prior to construction.
- .3 The Contractor shall have absorbent pads on site in case of any oil leaks or contaminants entering the water.
- .4 All operations to be conducted in accordance with Best Management Practices.

**END OF SECTION**

## **Section 01 20 60 – Demolition of Structures**

### **Part 1 General**

#### **1.1 RELATED REQUIREMENTS**

- .1 General Conditions and related contract documents form an integral part of this section.

#### **1.2 WASTE MANAGEMENT GOALS**

- .1 Prior to start of Work conduct meeting with Owner to review and discuss PWGSC's Waste Management Plan and Goals.
- .2 Accomplish maximum control of solid construction waste.
- .3 Preserve environment and prevent pollution and environment damage.

#### **1.3 DEFINITIONS**

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .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-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2 Returning reusable items including pallets or unused products to vendors.
- .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.

#### **1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Owner.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non salvageable materials from salvaged items. Transport and deliver non salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Owner.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  - .1 On site source separation is recommended.
  - .2 Remove co-mingled materials to off-site processing facility for separation.
  - .3 Provide waybills for separated materials.

#### **1.5 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste into waterways, storm, or sanitary sewers.
- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

#### **1.6 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises.

#### **1.7 SCHEDULING**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 CLEANING**

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

**3.2 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT**

- .1 Schedule E Government Chief Responsibility for the Environment of British Columbia:

<b>Address</b>	<b>General Inquires</b>	<b>Fax</b>
Ministry of Environment #200-10470 152nd Street Surrey B.C. V3R 0Y3	604-582-5200	604-930-7119
Waste Reduction Commission Soils and Hazardous Waste 770 South Pacific Blvd, Suite 303 Vancouver BC V6B 5E7	604-660 9550	604-660 9596

**END OF SECTION**

## **Section 01 33 00 – Submittal Procedures**

### **Part 1 General**

#### **1.1 RELATED REQUIREMENTS**

- .1 General Conditions and related contract documents form an integral part of this section.

#### **1.2 ADMINISTRATIVE**

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

#### **1.3 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**

- .1 Submit shop drawings, product data and samples specified to Engineer for review.
- .2 Shop drawings:
  - .1 Prepared by Contractor, subcontractor, supplier, or distributor.
  - .2 Illustrate appropriate portion of work, showing fabrication, layout, setting, or erection details as specified in appropriate sections.
- .3 Product data:
  - .1 Certain specification sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings, provided that product concerned is clearly identified.
  - .2 Submit in sets, not as individual submissions.
- .4 Samples: submit in sizes and quantities specified.
- .5 Submission requirements:
  - .1 Schedule submissions at least 5 days before dates reviewed submissions will be needed.
  - .2 Submit number of copies of product data and shop drawings which Contractor requires for distribution plus copies which will be retained by Engineer.
  - .3 Accompany submissions with transmittal letter in duplicate.
- .6 Coordination of submissions:
  - .1 Review shop drawings, product data, and samples before submission.
  - .2 Coordinate with field construction criteria.
  - .3 Verify catalogue numbers and similar data.
  - .4 Coordinate each submittal with requirements of the work of all trades and the Contract documents.
  - .5 Responsibility for errors and omissions in submittals is not relieved by Engineer's review of submittals.

- .6 Responsibility for deviations in submittals from requirements of Contract documents is not relieved by Engineer's review of submittals, unless Engineer gives written acceptance of specified deviations.
- .7 Notify Engineer in writing, at time of submission, of deviations in submittals from the requirements of the Contract documents.
- .8 After Engineer's review, distribute copies.

#### **1.4 OPERATION AND MAINTENANCE MANUAL**

- .1 Upon completion of project, submit to Engineer 3 copies of the operation and maintenance data as specified in various sections.

#### **1.5 CERTIFICATES AND TRANSCRIPTS**

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

#### **Part 2 Products**

##### **2.1 NOT USED**

- .1 Not Used.

#### **Part 3 Execution**

##### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **Section 01 35 29.06 – Health and Safety Requirements**

### **Part 1 General**

#### **1.1 RELATED REQUIREMENTS**

- .1 General Conditions and related contract documents form an integral part of this section.

#### **1.2 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 Province of British Columbia
  - .1 Workers Compensation Act, RSBC 1996 - Updated 2012.

#### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operations.
  - .3 Risk Management and Safety Procedure for possible events including but not limited to storm, fire, and fall.
- .3 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan.

Revise plan as appropriate and resubmit plan to Departmental Representative 5 days after receipt of comments from Departmental Representative.

- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

#### **1.4 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award. Contractor to submit written acknowledgement to CSST along with Ouverture de Chantier Notice.
- .3 Work zone locations include:
  - .1 Deep Bay Small Craft Harbour.
- .4 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

#### **1.5 SAFETY ASSESSMENT**

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

#### **1.6 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

#### **1.7 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with:
  - .1 Deep Bay Small Craft Harbour Authority

#### **1.8 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan

until final demobilization from site. Health and Safety Plan must address project specifications.

- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

## **1.9 RESPONSIBILITY**

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

## **1.10 COMPLIANCE REQUIREMENTS**

- .1 Comply with Workers Compensation Act, B.C. Reg.
- .2 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .3 Comply with Occupational Health and Safety Regulations, 1996.
- .4 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C.
- .5 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

## **1.11 UNFORSEEN HAZARDS**

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

## **1.12 HEALTH AND SAFETY CO-ORDINATOR**

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

### **1.13 POSTING OF DOCUMENTS**

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

### **1.14 CORRECTION OF NON-COMPLIANCE**

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

### **1.15 WORK STOPPAGE**

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

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not used.

## **Part 3 Execution**

### **3.1 NOT USED**

- .1 Not used.

## **Section 01 35 43 – Environmental Procedures**

### **Part 1 General**

#### **1.1 RELATED REQUIREMENTS**

- .1 Section 01 20 60 DEMOLITION OF STRUCTURES
- .2 Section 01 35 29.06 HEALTH AND SAFETY REQUIREMENTS
- .3 Section 03 30 00 CAST-IN-PLACE CONCRETE

#### **1.2 REFERENCES**

- .1 Definitions:
  - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

#### **1.3 IN WATER WORKS**

- .1 Construction equipment to be operated on land or from floating barge equipment.
- .2 Waterways to be kept free of excavated fill, waste material and debris.
- .3 Do not skid logs or construction materials across waterways.

#### **1.4 NOTIFICATION**

- .1 Engineer will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, propose corrective action and take such action for approval by Engineer.
  - .1 Take action only after receipt of written approval by Engineer.

- .2 Engineer will issue stop order of work until satisfactory corrective action has been taken.
- .3 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

**Part 2 Products**

**2.1 NOT USED**

**Part 3 Execution**

**3.1 CLEANING**

- .1 Leave work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment to the approval of the Owner.

**END OF SECTION**

## **1. General**

### **1. RELATED REQUIREMENTS**

1. 01 01 00 – GENERAL REQUIREMENTS
2. 01 33 00 – SUBMITTAL PROCEDURES
3. 01 35 29.06 – HEALTH AND SAFETY REQUIREMENTS

### **2. MEASUREMENT AND PAYMENT**

1. Cast-in-place concrete will not be measured separately but paid for as fixed price item.
2. Supply and installation of reinforcement, anchor bolts, nuts and washers and bolt grouting not measured but considered incidental to work.

### **3. REFERENCE STANDARDS**

1. Canadian General Standards Board (CGSB)
  1. CAN/CGSB-51.34-[M86] , Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
2. CSA Group
  1. CSA A23.1/A23.2-[14] , Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

## **2. Products**

### **1. MATERIALS**

1. Portland-limestone cement: Type GU to CSA A3001
2. Water: to CSA A23.1/A23.2
3. Aggregates: to CSA A23.1/A23.2
4. Admixtures:
  1. Air entraining admixture: to ASTM C260.

### **2. CONCRETE MIXES**

1. Concrete to meet performance criteria in accordance with CAN/CSA A23.1/A23.2.
2. Durability and class of exposure: C-1.
3. Maximum water cement ratio to be 0.40
4. Air content to be between 5% and 8%

5. Concrete mix design to be submitted for approval prior to placing concrete. The mix design is not to be changed without prior approval of the Departmental Representative.

### **3. Execution**

#### **1. PLACING, FINISHING AND CURING CONCRETE**

1. All concrete to be placed in accordance with the requirements of Clause 19 CSA Standard A23.1-M and as indicated on the drawings.
2. All concrete to be placed continuously between start of placement and a control joint. Control joint locations to be proposed by the contractor and are subject to prior approval by the Departmental Representative. Joint surfaces of cured concrete to be roughened and thoroughly cleaned.
3. Accurate records to be maintained for all cast-in-place concrete including date of placement, location, quantity, temperature and test samples taken.
4. The Departmental Representative to be notified prior to commencement of concrete placement
5. All defective concrete to be removed and replaced as directed by the Departmental Representative.
6. Concrete to be vibrated adequately by means of mechanical vibrators. Rock pockets and honeycombing will not be accepted.
7. Surface texture: non-skid finish on top, steel trowel or form finish on sides and bottom.
8. Cold and hot weather concrete work to be carried out in conformance with Clause 21 of CSA Standard A23.1-M. Procedures for this work to be submitted to the Departmental Representative for approval.
9. All concrete to be protected and cured in accordance with CSA Standard A23.1-M.

#### **2. FIELD QUALITY CONTROL**

1. Provide the Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4 and CSA-G279.
2. Provide records from in-house quality control programme based upon plant certification requirements for inspection and review.
3. Upon request, provide Consultant with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
4. The Departmental Representative to be notified 24 hours prior to placement of concrete.
5. Unless noted otherwise an inspection and testing firm appointed and paid for by the Contractor will collect and test a minimum of 3 concrete cylinders per concrete

batch. One concrete cylinder to be tested after 7 days. The remaining 2 cylinders to be tested after 28 days. The test results to be made available to the Departmental Representative.

6. The Contractor to permit the testing firm free access to all portions of the work and to co-operate with the testing firm in carrying out the work.

**END OF SECTION**

## **1 GENERAL**

### **1.1 SUMMARY**

#### .1 Documents

- .1 This Division 26 Section, together with all other Sections forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts and Divisions.

#### .2 This Section Includes:

- .1 Abbreviations
- .2 Brief Summary of Work
- .3 Phasing
- .4 Codes, Standards, and Regulatory Requirements
- .5 Permits, Fees, and Inspection
- .6 Quality of Work
- .7 Qualification of Tradesmen
- .8 Responsibility and Coordination
- .9 Protection
- .10 Drawings and Measurements
- .11 Materials and Equipment
- .12 Identification
- .13 Approvals
- .14 Testing and Adjusting
- .15 Cleaning and Repair
- .16 Guarantee
- .17 Project Documentation: Shop Drawings, Maintenance Manuals, "As-Built" Drawings
- .18 Loose Equipment
- .19 Substantial Performance Inspection
- .20 Measurement and Payment
- .21 Evaluation of Changes to the Contract

## **1.2 ABBREVIATIONS**

- .1 The following project-specific equipment abbreviations have been used in these specifications:
  - .1 RC: New Receptacle Cabinet with receptacle panel, receptacles, and top light fixture.
  - .2 TRC: New Transformer Receptacle Cabinet with distribution panel section, receptacle panel, receptacles, and top light fixture.
  - .3 SCH: Fisheries and Oceans Canada, Small Craft Harbours, the Project Owner.
- .2 Other abbreviations to CSA Z85.

## **1.3 BRIEF SUMMARY OF WORK**

- .1 Refer to Section 01 00 11 Summary of Work.
- .2 The work includes but is not limited to:
  - .1 Provision and installation of two (2) MDP enclosures, distribution equipment and feeders cables..
  - .2 The provision of shop drawings to Engineer for approval prior to the purchase of electrical equipment to be installed.
  - .3 All planning, organizing, scheduling, managing and coordinating as required with BC Hydro, SCH Harbour Manager, SCH Project Manager and the Engineer.
  - .4 Completion of the deficiency list as compiled by SCH Project Manager and Engineer.

## **1.4 PHASING**

- .1 Phase the work to minimize service outages.
- .2 Outages shall not exceed 24 hours. Schedule the work to reduce outage duration to less than 24 hours wherever possible.
- .3 Prepare a detailed schedule of proposed shutdown of existing power services giving date, time, duration of each shutdown and the services affected and submit to the Engineer and Owner for comment and necessary changes. Provide 2 weeks' notice of proposed shutdown.
- .4 The Owner reserves the right to insist upon changes to the schedule of shutdowns without penalty or cost.

- .5 Erect barricades and provide temporary signage and lighting as necessary to protect the public during construction activities. Do not leave tripping hazards or loose planks while wharf is unattended.

## **1.5 CODES, STANDARDS, AND REGULATORY REQUIREMENTS**

- .1 Any reference to Codes, Standards, and Regulations in these Specifications shall be taken as the latest or the most current in effect at time of tender.
- .2 Comply with all requirements of the Canadian Electrical Code - Part I, including all Provincial and other amendments, Electrical Bulletins, and any local by-laws or rules regulating the installation of electrical equipment. In no instance, however, shall the standards established by the Contract Documents be reduced by any of these Codes or Regulations.
- .3 All materials shall bear the approval of the Canadian Standards Association and where applicable, the Underwriters' Laboratories of Canada or alternately shall bear local approval from the Electrical Inspection Department having jurisdiction. Include in the Tender all costs associated with obtaining local approvals.
- .4 Operating voltages to CAN3-C235.

## **1.6 PERMITS, FEES, AND INSPECTION**

- .1 Before starting work submit the appropriate quantity of Drawings and Specifications to the Electrical Inspection Department and other authorities having jurisdiction and obtain all necessary approvals and permits. Include all costs of approvals and all permit fees in the tender.
- .2 Engineer will provide Drawings and Specifications required by the Contractor for submission to the Electrical Inspection Department, the Supply Authority, and other authorities having jurisdiction, at no cost.
- .3 Arrange for inspection of the work as the installation progresses and as further required (as well as attendance during verification) by all applicable authorities having jurisdiction.
- .4 Notify Engineer of changes required by Electrical Inspection Department prior to making changes.
- .5 Upon completion, and before final payment will be made, present to the Engineer a certificate of unconditional approval for all electrical work from the Electrical Inspection Department and other authorities having jurisdiction.

## **1.7 QUALITY OF WORK**

- .1 Unless otherwise indicated, all materials supplied shall be new and of the quality indicated in these Specifications. Otherwise, they shall be of the best commercial quality obtainable for the purpose.
- .2 Manufacturers' directions shall be followed in all cases where the manufacturers of equipment or materials used in this work furnish directions covering points not shown on the Drawings or Specifications.
- .3 Unless otherwise directed, all installed materials or equipment exposed to view shall be plumb, true, square, and/or level as the case directs and, where applicable, located symmetrically.

### **1.8 QUALIFICATION OF TRADESMEN**

- .1 The work shall be performed by qualified and certified tradesmen as set out in the Electrical Safety Regulation within the Electrical Safety Act.
- .2 Submit list showing names and qualifications of key supervisory personnel.

### **1.9 RESPONSIBILITY AND COORDINATION**

- .1 Supply all labour, materials, equipment, tools, and incidentals necessary to provide a complete electrical installation as indicated on the Drawings and as set out in these Specifications.
- .2 The Drawings and Specifications complement each other and what is called for by one is binding as if called for by both. If there is any doubt as to the meaning or true intent due to a discrepancy between the Drawings and Specifications, obtain a ruling from the Engineer prior to tender closing. Failing this, the most expensive alternative is to be allowed for.
- .3 Advise the Engineer of any specified equipment, material, or installation of same which appears inadequate or unsuitable or which is in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction. Provide all labour and materials which are obviously necessary or reasonably implied to be necessary to complete the work as if the work was shown on the Drawings and/or described in the Specifications.

### **1.10 PROTECTION**

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark live parts "LIVE 120 VOLTS," or with appropriate voltage.
- .3 Arrange for installation of temporary covers for enclosures containing electrical distribution equipment. Keep these covers locked except when under direct supervision of electrician.

### **1.11 DRAWINGS AND MEASUREMENTS**

- .1 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work. Do not scale the Drawings.
- .2 The Drawings show approximate locations of outlets, equipment, and apparatus but the right is reserved to make such changes in location before installation of the work as may be necessary to meet the exigencies of construction in any way. No extra will be allowed and conversely, no credit shall be expected for such changes unless for each item of work the distance moved exceeds 3 m prior to final installation of same.
- .3 Take field measurements where equipment and material dimensions are dependent upon structure dimensions.

### **1.12 MATERIALS AND EQUIPMENT**

- .1 Equipment and material to be new and CSA-certified. Where there is no alternative to supplying equipment which is not CSA-certified, obtain special approval from Electrical Inspection Department.
- .2 Factory assemble control panels and component assemblies.

### **1.13 IDENTIFICATION**

- .1 Identify all pieces of electrical equipment other than conduits and conductors with engraved nameplates, having white characters on black or dark background, mechanically attached via rivets.
- .2 Nameplate wording shall be such as to indicate clearly the function of each piece of equipment so identified. Prior to manufacture of nameplates, obtain approval from the Engineer for wording intended.
- .3 Provide laminated plastic nameplates at indoor locations and inside equipment cabinets that normally remain closed.
- .4 Provide 316L polished lamcooid nameplates for all outdoor equipment, minimum 12 mm high engraved text with white baked-on enamel filling and black background. Four threaded studs welded at the back for mechanical attachment to outdoor equipment. Apply Secaflex or equal sealant on rear of nameplate to seal stud holes.

### **1.14 APPROVALS**

- .1 Requests for approval of the substitution of materials pertaining to electrical work prior to awarding of any contract must be submitted to the Engineer in duplicate, so that they are received by the Engineer at least five (5) working days prior to the close of

tender or of bid depository, whichever is the earlier. ***Note that facsimile submittals will NOT be accepted.***

- .2 All submissions shall include the following information:
  - .1 Name and identification of specified item.
  - .2 Manufacturer, brand name, and catalogue number of the alternative item proposed.
  - .3 Detailed technical data and characteristics of alternative item such as dimensions, voltage, power requirements, performance characteristics, etc.
  - .4 A list of any and all changes to the installation which may be required as a result of the substitution.
- .3 Review by the Engineer of alternate materials as permitted above is only a general approval in principal and shall not relieve the Contractor of his responsibility to ensure that any approved alternate materials perform in the same manner and with the same intent as the originally specified material would have otherwise performed.
- .4 Where such substitutions alter the design or space requirements indicated on the Drawings, include all material, labour, design, and engineering costs for the revised design and construction including costs of all other trades affected and those incurred by the Engineer.
- .5 It is the Contractor's responsibility to ensure substituted products are approved and that suppliers have written approval indicating conditions of any such approval. Alternate manufacturers who do not have such approval shall not be used in the work. If requested by the Engineer, the Contractor for Division 16 shall submit for inspection, samples of both the specified and the proposed substitute items on short notice.

#### **1.15 TESTING AND ADJUSTING**

- .1 Coordinate and pay for all tests specified herein including further tests as required by authorities having jurisdiction.
- .2 All testing shall be performed after each system installation has been completed and prior to the system being put into continuous operation unless otherwise noted.
- .3 Perform the testing, adjusting, and balancing only when conditions are commensurate with actual operating conditions for the given system.
- .4 Advise the Engineer 48 hours in advance of each test. Carry out tests in the presence of Engineer.
- .5 The Electrical Contractor shall use his own forces for the following tests:

- .1 Test phase relationships and polarity at all equipment and outlets and devices.
- .2 Test all circuits originating from branch distribution panels.
- .3 Provide ground resistance tests for all circuits.
- .6 Submit typed test reports to the Engineer. Include individual insulation resistance results for each feeder utilizing Type G-GC or Teck cable.

#### **1.16 CLEANING AND REPAIR**

- .1 At the conclusion of the job and before the project will be accepted by the Owner, all panelboards and other electrical equipment shall be clean and free of dust, plaster, paint, and other foreign materials.
- .2 Repair, at no cost to the Owner, any equipment or structures damaged by the execution of Contract to its original condition.
- .3 Replace, at no cost to the Owner, any equipment or structures damaged by the execution of Contract which is irreparable.
- .4 Openings and cut-outs shall not be burned into panels. Oversized openings shall not be patched up with loose plates or oversized washers. Oversized openings shall be considered damage to the equipment and shall be treated as specified.

#### **1.17 GUARANTEE**

- .1 Use of installed equipment during construction shall not shorten or alter the guarantee.
- .2 Unless otherwise noted, the warranty period for all equipment shall commence on the date of Substantial Performance for the entire Construction Contract.
- .3 Within a period of one year from the date of final acceptance of work, replace or repair at own expense any defect in workmanship or material.

#### **1.18 PROJECT DOCUMENTATION**

- .1 Shop Drawings
  - .1 Submit one electronic plus three (3) prints of all shop and setting drawings or diagrams to the Engineer 10 working days in advance of requirements to allow time for review and comment. One print will be forwarded to the Owner, one will be retained by the Engineer for their office use, one copy will be marked and returned to the Contractor for correction if necessary, further reproduction, and distribution as required.

- .2 Shop drawings shall be neatly drafted and shall be complete and detailed. This requirement is mandatory for such items as panelboards and custom-fabricated equipment panels, consoles, or enclosures.
  - .3 Shop drawings shall:
    - .1 Be numbered in consecutive order;
    - .2 Indicate the specific name of the equipment and where it is to be installed;
    - .3 the name of the site/project where installation will occur;
    - .4 the name of the manufacturer, make, model, ratings;
    - .5 date of the drawing including notation of latest revision, if any;
    - .6 Indicate details of construction, dimensions, locations of cable terminations, capacities, weights and electrical performance characteristics of equipment and materials.
  - .4 Shop drawings shall be reviewed by the Contractor prior to submission to the Engineer. **Shop drawings not bearing Contractor's approval stamp, approval date, signature**, and project name will be returned without comment.
  - .5 Review of shop drawings by the Engineer is for the sole purpose of ascertaining conformance with the general design intent. The review shall not mean approval of the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents.
  - .6 The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.
- .2 Maintenance Manuals
- .1 Furnish to the Engineer three (3) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Contract.
  - .2 Submit all instructions first in draft for approval prior to final issue.
  - .3 Manufacturers' advertising literature or catalogues will not be accepted for operating and maintenance instructions.
  - .4 Manufacturers' parts list shall be included in each Maintenance Manual.

- .5 Each set shall consist of a 3-ring binder and a flyleaf with the name of the General Contractor, Electrical Subcontractor, and major equipment suppliers, or their local representatives if they are not local manufacturers, together with addresses and telephone numbers of all parties.
  - .6 Each system or piece of equipment shall have its own section separated from the next by a labelled divider. Shop drawings shall be included in the appropriate section. They shall be fastened into the book by means of a tab which will allow the drawings to be unfolded without being removed from the book.
  - .7 Include copies of all applicable guarantees, warranties, inspection approval certificates, and test certificates.
- .3 "As-Built" Drawings
- .1 Refer to Division 1 of these Specifications.
  - .2 Maintain in the job site office in up-to-date condition, one (1) complete set of whiteprints of each of the Electrical Contract Drawings and one (1) set of Specifications, including Revision Drawings, marked clearly and indelibly in red, indicating "As-Built" conditions where such conditions deviate from the original directions of the Contract Documents, and indicating final installation of feeders and branch circuits.
  - .3 "As-Built" drawing markings shall include but shall not be limited to the following:
    - .1 All changes in circuiting
    - .2 Size and routing of all conduits for all branch circuits including power, lighting, and systems. Accurately record on "As-Built" drawings the size and routing of all installed raceways and cables.
    - .3 Number and size of conductors in raceways and cables
    - .4 Location of all junction and pull boxes
    - .5 All changes to electrical installation resulting from Addenda, Change Orders, and Field Instructions
    - .6 Exact location of all services left for future work
    - .7 Location by accurate horizontal and vertical dimensions of the routes and terminations of all raceways and cables installed underground. **"As-built" mark-ups for area below the Main Distribution Panel (MDP) shall include data on existing and new installation showing location and size of ducts, and number and size of conductors therein.**

- .4 Each "As-Built" drawing as defined above shall bear the Contractor's identification and signature, the date of record, and the notation: "*We hereby certify that these Drawings represent the condition as built.*"
- .5 Deliver "As-Built" mark-up drawings to the Engineer at 'Substantial Completion' of the Contract for review and comment and, if necessary, revision. A holdback will be effected by the Engineer until "As-Built" drawing mark-ups are delivered in good order as required herein.

### **1.19 LOOSE EQUIPMENT**

- .1 All loose and portable components and equipment to be provided shall be handed over to the Owner at Substantial Performance of the Contract and receipts obtained.
- .2 Copies of such receipts shall be given to the Engineer, with a copy included in Maintenance Manual.

### **1.20 SUBSTANTIAL PERFORMANCE INSPECTION**

- .1 Before the Engineer is requested to make a Substantial Performance inspection, submit written confirmation that:
  - .1 All equipment is operational, plumb, clean, and correctly labelled
  - .2 All Test Reports have been submitted
  - .3 All certificates of final acceptance from the authorities having jurisdiction have been received and submitted to the Engineer
  - .4 Equipment has been cleaned, touched up, or refinished as necessary to present a new appearance
  - .5 All loose equipment including spare parts and replacement parts have been turned over to the Owner and receipts obtained for same
  - .6 The Maintenance Manual has been submitted
  - .7 The "As-Built" drawing mark-ups have been submitted to the Engineer
- .2 Notwithstanding any other provisions of the Contract, failure to complete all of the above shall give cause to deny the issuance of a Substantial Performance Certificate.

### **1.21 MEASUREMENT AND PAYMENT**

- .1 Notwithstanding any other provisions of this Contract, supply the following general information and any additional information as may be requested by the Engineer, as part of each Monthly Progress Claim. Indicate the labour cost and the material cost separately for each *Item of Work*.

- .2 **Items of Work** includes the supply and installation of, and shall not necessarily be limited to the following:
  - .1 MDP-1 Enclosure and interior components.
  - .2 Private MDP enclosure and interior components (feeder cables, ground bus).
  - .3 Feeder cables.
  - .4 Documentation including shop drawings, maintenance manuals and final mark-ups for "As-Built" drawings
  - .5 Mobilization and demobilization including clean-up
- .3 Progress claims will not be certified nor payment made beyond 95% before holdback is applied for each item of work as previously defined or on the overall contract until commissioning and verification of the systems have been completed. This procedure is to allow for any necessary deficiency holdbacks on items which do not become apparent until the systems have been fully commissioned and are operational.
- .4 Format for Monthly Progress Draws shall be similar to the sample shown at the end of this section.
- .5 For each Monthly Progress Draw, change orders shall be listed separately.

## 1.22 EVALUATION OF CHANGES TO THE CONTRACT

- .1 Notwithstanding other provisions of the Contract, this Contractor shall supply detailed information for the valuation of all changes to the Contract. Such information shall include, but not necessarily be limited to, the following:
  - .1 Labour hours per unit of material or equipment to be added, deleted, or altered.
  - .2 Units of material or equipment to be added or deleted.
  - .3 Cost to the Contractor per unit of material, equipment, and labour broken down by category of labour and type of material or equipment.
  - .4 Extensions of the above to arrive at total costs.
  - .5 Other miscellaneous and identifiable charges as allowed in the General Conditions.
- .2 Include in the valuation of any change to the Contract the cost, if any, of recording such change on the "As-Built" drawings as previously specified.

## 2 PRODUCTS

- .1 Not used



**1 GENERAL****1.1 SECTION INCLUDES**

- .1 Teck armoured cable, RW90 XLP, G/GC portable power cable.
- .2 Wire connectors
- .3 Box connectors for cable

**1.2 RELATED WORK**

- .1 Section 26 05 01 - Electrical General Requirements

**1.3 REFERENCES**

- .1 Wires and Cables
  - .1 CSA C22.2 No. 0.3, Test Methods for Electrical Wires and Cables
  - .2 CSA C22.2 No. 65, Wire Connectors
  - .3 CAN/CSA C22.2 No. 131, Type Teck 90 Cable
- .2 Wire and Box Connectors
  - .1 CAN/CSA-C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware
  - .2 CSA C22.2 No. 65, Wire Connectors

**2 PRODUCTS****2.1 WIRE AND CABLE - GENERAL**

- .1 Unless otherwise directed, wire and cable shall be copper conductors, sized as indicated.
- .2 Except where otherwise directed or required by The Canadian Electrical Code or other applicable regulations, wire and cable insulation shall be Type RW90, cross-linked polyethylene insulated for 600 V and rated not less than 90°C.
- .3 All conductors #8 AWG and larger shall be stranded, Type RW90, cross-linked polyethylene insulated for 1000 V and rated not less than 90°C.

## **2.2 TECK CABLE**

- .1 Conductors
  - .1 Grounding conductor: copper
  - .2 Circuit conductors: copper, size as indicated.
- .2 Insulation: chemically cross-linked thermosetting polyethylene, rated type RW90, 600 V.
- .3 Inner jacket: polyvinyl chloride material.
- .4 Armour: interlocking aluminium.
- .5 Overall covering: polyvinyl chloride material.
- .6 Connectors: watertight, approved for Teck cable installation.

## **2.3 PORTABLE POWER CABLE**

- .1 Approved for wet locations, for extra hard usage, 90°C, 2000 V insulation, ultraviolet-resistant black jacket.
- .2 Type G or Type G-GC, multi-conductor, with separate insulated ground check conductor and separate ground conductors.
- .3 Type W, single-conductor with separate polyester braid reinforcement between the insulation and jacket.

## **2.4 WIRE AND BOX CONNECTORS AND MISCELLANEOUS MATERIALS**

- .1 Connectors for wire and cable splices and taps: Unless otherwise directed, use 3M Co. 'Scotchlok,' Thomas & Betts PT Series, Buchanan 'B,' IDI Electric 'Super Nut,' or approved equal, for conductors #8 AWG or smaller; Burndy 'Servit' Type KSU or approved equal for conductors #1/0 AWG and smaller; and Burndy 'OKlip' Type KVSU or approved equal for conductors 750 MCM or smaller.
- .2 Clamps, glanding connectors, or box connectors for armoured cable as required.
- .3 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.
- .4 Copper, short barrel crimp-on compression type connectors as required, sized for conductors.

**2.4 WIRE AND BOX CONNECTORS AND MISCELLANEOUS MATERIALS (cont.)**

- .5 Plastic electrical insulation tape: Scotch #88 or approved equal.
- .6 Kellums grips: double-eye, double-weave, stainless steel.

**3 EXECUTION**

**3.1 INSTALLATION - GENERAL**

- .1 Unless noted otherwise, perform all installation and provide new materials to match existing.

**3.2 INSTALLATION OF WIRES AND CABLES - GENERAL**

- .1 Unless specifically indicated otherwise, all wiring to MDP and to RCs on floats shall be Type G or Type G-GC.
- .2 All wire from MDP or from RC to luminaires on float light standards to be Teck 90 600V cable.
- .3 Use no wire smaller than #12 AWG, unless otherwise directed.
- .4 No splices, other than those shown, will be permitted. All splices must be made in junction boxes above water level.
- .5 Between float sections provide a 0.9 meter minimum loop as shown on drawings.
- .6 Coil extra 1.5 meters of cable (mounted at low tide) on landing at bottom of gangway as shown on drawings.
- .7 All cables and cords shall be adequately supported to avoid strain on connections. Where cords and cables are suspended vertically, use stainless steel cable grips (Kellums or equal).

**3.3 INSTALLATION OF WIRE AND BOX CONNECTORS**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Install mechanical pressure-type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65.
  - .2 Install fixture type connectors and tighten. Replace insulating cap.
- .2 Wire and cable splices and taps shall be made with approved connectors used in accordance with the manufacturer's instructions.
- .3 Wrap connectors having exposed conductive surfaces after installation, with self-fusing rubber electrical tape, applying enough servings to provide uniform covering not

thinner than the insulation of the largest conductor connected and overlapping the insulation of each connected conductor by not less than 12 mm. Protect the rubber tape with a final overwrap of plastic tape.

END OF SECTION

## **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 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
- .2 Transformer grounding shall comply with CSA C22.2 No.41.
- .3 All grounding conductors to be stranded soft annealed copper unless otherwise noted.
- .4 Install complete grounding and bonding system in accordance with Canadian Electrical Code and local inspection authority requirements.

### **1.3 TESTING REQUIREMENTS**

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions. Measure ground grid resistance.
- .2 Any third party testing agency costs for the testing and reporting shall be included in the Electrical Division base tender and shall be carried out by a pre-approved testing agency.

## **2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Grounding equipment to: CSA C22.2 No.41.

### **2.2 EQUIPMENT**

- .1 Clamps for grounding of conductor, size as required.
  - .1 Rod electrodes, copper clad steel 20mm [3/4"] dia by 3m [10'] long or as indicated.
  - .2 System and circuit, equipment, grounding conductors, bare stranded copper, soft annealed, sized as indicated. Insulation where specified or required to be green.
  - .3 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
  - .4 Non-corroding accessories necessary for grounding system, type, size material as indicated, including but not necessarily limited to:
    - .1 Grounding and bonding bushings.
    - .2 Protective type clamps.
    - .3 Bolted type conductor connectors.

- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

### **2.3 STANDARDS OF ACCEPTANCE**

- .1 Acceptable manufacturers:
  - .1 Burndy Corp.
  - .2 Erico Inc.
  - .1 Cadweld.

## **3 EXECUTION**

### **3.1 INSTALLATION - GENERAL**

- .1 Install complete permanent, continuous bonding to ground system, including conductors, connectors, and accessories. Run bonding wire in every conduit.
- .2 Provide all grounding and bonding to conform with the latest edition of the Canadian Electrical Code and the latest grounding and bonding instructions of the Inspection Authority, with any further requirements as noted herein or on the drawings.
- .3 Bonding to ground and grounding conductors shall be as specified elsewhere and shall be bare copper or have green insulation with identification at all ends.
- .4 Neutral to ground conductors shall be copper conductor of size indicated with white insulation.
- .5 Install connectors in accordance with manufacturer's instructions.
- .6 Protect exposed grounding conductors from mechanical injury.
- .7 Use cable lugs for bonding non-current carrying metallic parts of electrical equipment to ground.
- .8 Connections to switchboards, ground buses, and other equipment.
- .9 Soldered joints are not permitted.

### **3.2 GROUNDING BUSES**

- .1 Provide a ground bus in the main electrical room. Ground bus shall consist of suitable length of 50mm x 6mm [2"x ¼"] copper bus mounted on a 25mm [1"] insulating standoffs. This bus shall be drilled and tapped to receive all the grounding conductors indicated and an engraved nameplate or tag installed above or below individual conductors indicating their function.

- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 3/0 AWG or as indicated.
- .3 Copper or bronze lugs required for termination of all copper conductors at ground busses.

### **3.3 POST MOUNTED LUMINAIRE BONDING**

- .1 Provide #10 AWG bonding conductor with green RW90 X-link insulation to luminaire standards. Connect to luminaire corrosion resistant ground stud or ground clamp.

### **3.4 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 01.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions.
- .3 Measure ground grid resistance with earth test megohmmeter and install additional ground rods and conductors as required until resistance to ground complies with Code requirements and is less than  $1\Omega$ .
- .4 Carry out all tests required by the Electrical Inspection Authority and provide all required reports and copied to the Consultant. Include all associated costs.
- .5 Ensure test results are satisfactory before energizing the electrical system.

END OF SECTION

## **1 General**

## **2 Products**

### **2.1 SUPPORT CHANNELS**

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

## **3 Execution**

### **3.1 INSTALLATION**

- .1 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .2 Fasten exposed conduit or cables to boardwalk, approach and wharf construction or support system using straps.
  - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3 Beam clamps to secure conduit to exposed steel work.
- .3 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
  - .3 Support cables in galvanized cable tray where indicated.
- .4 For surface mounting of two or more conduits use channels at 1 m oc spacing.
- .5 Provide metal brackets, frames, hangers, clamps, cable tray and related types of support structures where indicated or as required to support conduit and cable runs.
- .6 Ensure adequate support for raceways and cables dropped vertically to equipment.
- .7 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .8 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.
- .9 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

## **1 GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Conduits, conduit fastenings, and conduit fittings

### **1.2 REFERENCES**

- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware
- .2 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
- .3 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit

### **1.3 LOCATION OF CONDUIT**

- .1 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.

## **2 PRODUCTS**

### **2.1 CONDUITS**

- .1 Rigid PVC conduit: to CSA C22.2 No. 211.2
- .2 Rigid galvanized steel threaded conduit (RGS) to ANSI C80.1.
- .3 Flexible metal conduit: to CSA C22.2 No. 56, aluminium or zinc-coated steel, liquid-tight. "Spec-Flex" or equivalent.

### **2.2 CONDUIT FITTINGS**

- .1 Fittings: manufactured for use with conduit specified.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
- .3 Liquid-tight fittings for liquid-tight flexible conduit: equivalent to T&B 'Super-Tite' 5000 Series. All connectors shall have insulated throats.
- .4 Nylon-Insulated Conduit Bushings: T&B or equal.

### **2.3 CONDUIT BOXES**

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

### **2.4 PULL CORD**

- .1 For 25 mm or larger trade size conduit: 6 mm diameter nylon or polypropylene cord or other approved product.

## **3 EXECUTION**

### **3.1 INSTALLATION - GENERAL**

- .1 Generally, and where permitted by the Canadian Electrical Code, use rigid PVC conduit for all wiring unless otherwise noted.
- .2 Do not install PVC where it may be subject to mechanical injury.
- .3 For any one conduit section, use the maximum possible conduit length. Installations which use partial lengths and/or excessive number of couplings shall not be acceptable and shall be replaced at Contractor's expense.
- .4 Install exposed conduits in close parallel groups wherever two or more conduits running in the same direction would otherwise be within 1800 mm of each other.
- .5 Install all conduits parallel or at right angles to structure lines, as the case directs.
- .6 Do not install conduit through structural members unless specific instructions are given.
- .7 Install a pull cord in all empty conduits.

END OF SECTION

## **1 GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Dry type transformers to 600 V.

### **1.2 RELATED WORK**

- .1 Section 26 05 01 - Electrical General Requirements

### **1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C9, Dry-Type Transformers.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
  - .1 EEMAC GL1-3, Transformer and Reactor Bushings.
- .3 National Electrical Manufacturers Association (NEMA)
- .4 Transformers shall meet NEMA TP-1 (table 4.2) standards for energy efficiency.

## **2 PRODUCTS**

### **2.1 TRANSFORMERS**

- .1 Transformer provided for MDP-1 distribution:
  - .1 ANN, NEMA/CSA Type 2 enclosure
  - .2 Rating: 75 kVA, 3 phase, 60 Hz, 600-120/208V, Impedance 5%, delta-wye grounded
  - .3 Voltage taps standard +/- 2½% and +/- 5%
  - .4 Insulation: Class H 220°C insulation
  - .5 Windings: copper or aluminum
  - .6 Basic Impulse Level (BIL): standard
  - .7 Hi-pot: standard
  - .8 Average sound level: 50 dBA maximum
  - .9 Impedance at 170°C: standard
  - .10 Epoxy Potted
- .2 Transformer shall meet the energy efficiency per CAN/CSA-C802.2-00, Minimum Efficiency Values for Dry-Type Transformers.
- .3 Transformer shall be manufactured and tested (production tests) in accordance with CSA C9 (current issue) incorporating modifications as specified herein.
- .4 Dry type transformer shall be as manufactured by Schneider Group, Cutler Hammer, CGE, Rex, Hammond, Delta, Tracon or approved equal.

### **3 EXECUTION**

#### **3.1 INSTALLATION**

- .1 Transformers 75kVA and smaller may be wall mounted. Seismic restraint and structural support information shall be provided to the consultant when requested. Provide vibration isolation hangers to prevent transmission to building structure. Transformer to be installed to ensure adequate air circulation is available on all four sides.
- .2 Install transformers in level upright position, complete with vibration isolation pads in the base.
- .3 Loosen isolation pad bolts until no compression is visible.
- .4 Make primary and secondary connections in accordance with wiring diagram. Conductors shall not enter the transformer through the top of the enclosure.
- .5 Make flexible aluminum conduit connections on secondary sides of all transformer.
- .6 Energize transformer after installation is complete.

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 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 26 05 01.
- .2 Shop drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.
- .3 Shop drawings to include matching tub and trim details for factory installed low voltage relay cabinets where specified.

**1.3 PLANT ASSEMBLY**

- .1 Install circuit breakers in panelboards before shipment from plant.
- .2 Install and prewire low voltage relays assemblies where indicated.
- .3 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .4 All panelboards to be of a common manufacturer.

**1.4 FINISH**

- .1 Panel finish in electrical and equipment rooms and closets to be standard ASA Grey baked enamel for normal power service. Confirm with Consultant prior to shop finishing panels.

**PART 2 PRODUCTS**

**2.1 PANELBOARDS, DOORS AND TRIMS**

- .1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer.
- .2 Bus and breakers rated for 22 KA symmetrical, minimum, interrupting capacity or as indicated.
- .3 Tin plated aluminum bus with full size neutral.
- .4 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.
- .5 Mains, number of circuits and number and size of branch circuit breakers as indicated.
- .6 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank fillers for all spaces.

- .7 Concealed hinges and concealed trim mounting screws, hinged locking door with flush catch.
- .8 Panelboards to have flush doors. (Gasketed where required).
- .9 Provide two keys for each panelboard and key similar voltage panelboards alike.
- .10 Panel tubs to be typically 600mm [20"] wide.
- .11 Provide door within door trims where indicated to facilitate ease of service maintenance Each tub trim cover to be hinged and self-supporting and to swing out to expose breaker cable terminations and wireways. Hinged trim shall be secured with cover screws on opening side by concealed machine screws. Hinged breaker cover shall be recessed into the hinged overall tub cover. Breaker cover shall have latch type closures. Submit details on shop drawings prior to manufacturing.

## 2.2 BREAKERS

- .1 All breakers to be bolt on type, moulded case, non-adjustable and non-interchangeable trip, single, two and three pole, 120/208(240)V or 347/600V and with trip free position separate from "On" or "Off" positions.
- .2 Two and three pole breakers to have common simultaneous trip and able to be located in any circuit position within the panelboard. Minimum interrupting rating of breakers to be as follows:
  - .1 347/600V panelboards - 22,000 Amps at 347 volts.
  - .2 120/208V panelboards - 10,000 Amps at 250 volts.
- .3 Main breaker to be separately mounted at top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Provide circuit breakers with indicated trip ratings as shown in the panelboard schedules.
- .5 Provide at least 10% spare 15 Amp single pole breakers whether indicated or not.
- .6 Provide GFI type breakers for all shore power receptacles.

## 2.3 PANELBOARD IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01.
- .2 Nameplate for each panelboard size 5 (2 line) engraved as indicated and include panel designation and voltage/phase.
- .3 Complete circuit directory with typewritten card(s) located in slide-in plastic pocket(s) fixed to the back of the related door. Directory card to indicate the panel designation, mains size, voltage/phase and the location and load controlled of each circuit. Include a "letter sized" paper copy of each directory in the project maintenance manual.
- .4 Provide a plasticized typewritten information card fixed to the back of the each panel door. Information card to indicate the panel designation and location, feeder type

and size and locations of any controlling contactors and feeder pullboxes. Include a "letter sized" paper copy of each information card in the project maintenance manual.

**2.4 STANDARD OF ACCEPTANCE**

- .1 Siemens Canada.
- .2 Schneider Electric.
- .3 Eaton Cutler Hammer.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces.
- .2 Panelboards located in service rooms, mechanical rooms, and electrical rooms to be mounted on unistrut supports.
- .3 Mount panelboards to height given in Section 26 05 01 or as indicated.
- .4 Connect loads to circuits as indicated.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

## **1 GENERAL**

### **1.1 REFERENCES**

- .1 CSA C22.2 No. 5, 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)
- .2 Section 26 24 16 – Panelboards Breaker Type

### **1.2 PLANT ASSEMBLY**

- .1 Assemble panelboard interior and install circuit breakers before shipment.
- .2 Panelboards to fit available space within electrical kiosk enclosures.

## **2 PRODUCTS**

### **2.1 MAIN DISTRIBUTION PANEL (MDP-1) ENCLOSURE**

- .1 Enclosure (kiosk) shall be sized to fit the 347/600V, 225A panelboard, main breaker or safety switch (if separate components), gutter box or wireway, isolated neutral and ground busses and all required conduit and cable connections.
- .2 Kiosk shall be 12 gauge stainless steel or 3.2mm marine grade aluminium 5052-H32 powder coated ASA grey, rated NEMA 3R:
  - .1 bullet style grease-able hinges;
  - .2 drip edge on top and sides of doors;
  - .3 Weather strip around all doors.
  - .4 roof overhang on front;
  - .5 gutter box for bottom cable entry & exit;
  - .6 corrosion proof 3 point latch on each door with 9mm pad lock loop and hasp;
  - .7 All hardware shall be stainless steel.
- .3 Submit shop drawing of kiosk and all components to Engineer for approval prior to procurement.
- .4 Panelboard, main breaker or safety switch, and other components mounted to backboard inside kiosk. Ground bus and neutral bus mounted to backboard on insulated standoffs.
- .5 Kiosk shall be bolted to wharf deck with minimum 19mm galvanized bolts. Gutter box to extend beyond wharf edge for cable access under wharf.

- .6 Nameplate is 100 x 200mm black lamacoid with white lettering, machine-screw fixed to kiosk door.
- .7 Supplier shall be Valid Manufacturing Ltd. or approved equal.

## **2.2 MAIN DISTRIBUTION PANELBOARD**

- .1 Panelboard shall be rated 347/600V, 225A with 200AF/160AT main breaker, branch breakers, 100% neutral and lugs to fit cables from service entrance supply and to loads.
- .2 Panelboard shall be mounted on backboard inside kiosk and shall be CSA NEMA Type 3R construction. Submit shop drawings to Engineer for approval.
- .3 Panels shall be moulded-case, circuit breaker type, 22 kA interrupting rating.
- .4 Main bus bars shall be of tin-plated copper and equipped with pressure type solderless lugs. All bus work shall be suitably supported to withstand maximum short circuit current of 22 kA RMS amperes symmetrical.
- .5 Unused circuit positions shall be closed with substantial covers which require tools for removal.
- .6 Panelboards shall be fitted with a branch circuit grounding terminal bus firmly bonded to the inside of the panel enclosure consisting of a copper grounding bus with one terminal for each circuit position available in the panel. Branch circuit equipment grounding conductors shall terminate at this ground bus. This ground bus shall be connected to the isolated ground bus mounted outside the panelboard.
- .7 The neutral bus shall be attached but isolated from the panelboard enclosure. Branch circuit neutrals shall terminate on this neutral bus. The neutral bus shall be connected to the isolated neutral bus mounted outside the panelboard.
- .8 All breakers shall be of the same manufacturer.
- .9 Breakers shall be bolt-on. Plug-in type circuit breakers shall not be used.
- .10 Two- and three-pole circuit breakers shall have a common tripping mechanism and single handle. Handle ties are not acceptable.
- .11 Panelboards shall be as manufactured by Siemens Canada, Schneider Electric, Eaton Cutler Hammer, or approved equal.

## **3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Bolt panels securely to backplane inside electrical kiosk.

- .2 Connect the isolated neutral bus to the isolated ground bus mounted outside the panelboard. Connect the isolated ground bus to the earth ground electrode. Identify all ground bus wiring connections.
- .3 Upon completion of testing and commissioning, install permanent engraved circuit directory on the inside face of the panelboard.

END OF SECTION

**1 GENERAL**

**1.1 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data for enclosures and equipment including detailed fabrication drawings showing materials of construction and assembly.

**2 PRODUCTS**

**2.1 EQUIPMENT - GENERAL**

- .1 Outdoor weatherproof enclosures constructed of marine grade aluminum and as shown on the drawings.
- .2 Removable enclosure panels with formed edges, external component fasteners removable only from inside enclosure.
- .3 Doors: hinged, with padlocking means.
- .4 Hinges: heavy duty, stainless steel, non-removable pin for secure compartments.

**2.2 MDP ENCLOSURE**

- .1 Provide enclosure with cable entry, wireway, panelboard, isolated neutral bus, isolated ground bus and all fittings required for a safe and functioning main distribution panel with neutral grounding and bond-to-ground systems.

**3 EXECUTION**

**3.1 INSTALLATION**

- .1 Verify that components are assembled inside enclosure in accordance with reviewed shop drawings. Adjust or revise assembly if required.
- .2 Obtain local CSA approval of completed assembly.
- .3 Install equipment in locations as per drawings.

END OF SECTION

**1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 26 05 01 - Electrical General Requirements

**2 PRODUCTS**

**2.1 RECEPTACLES**

- .1 T-Slot duplex receptacles, CSA type 5-20R, 125 V, 20 A, U ground, white specification grade.
- .2 Use tamper resistant receptacles where required by Code and as indicated.
- .3 Receptacles of one manufacturer throughout project.
- .4 Standard of acceptance:
  - .1 Leviton 5340 series
- .5 Alternate Manufactures: Pass & Seymour, Hubbell

**3 EXECUTION**

**3.1 RECEPTACLES**

- .1 Mount receptacles securely within enclosures as indicated.

END OF SECTION

## 1) General

### a) RELATED REQUIREMENTS

- i) 01 01 00 – GENERAL REQUIREMENTS
- ii) 01 33 00 – SUBMITTAL PROCEDURES
- iii) 01 35 29.06 – HEALTH AND SAFETY REQUIREMENTS

### b) MEASUREMENT AND PAYMENT

- i) Granular base and subbase materials will be measured to ensure design depths and installation requirements have been met, but will be paid as a lump sum item and not measured separately for payment.

### c) ACTION AND INFORMATIONAL SUBMITTALS

- i) Submit product data sheets and sieve analyses.

## 2) Products

### a) MATERIALS

- i) Granular base: material in accordance with the following requirements:
  - (1) Crushed stone or gravel.
  - (2) Gradations to be within limits specified. Sieve sizes to CAN/CGSB-8.1.
    - (a) Granular Base

Sieve Designation	
100 mm	-
75 mm	-
50 mm	-
37.5 mm	-
25 mm	100
19 mm	-
12.5 mm	65-100
9.5 mm	-
4.75 mm	35-60
2.00 mm	22-45
0.425 mm	10-25
0.180 mm	-
0.075 mm	3-8

- (b) Los Angeles degradation: to ASTM C131 . Max. % loss by weight: 45

- (c) Crushed particles: at least 60 % of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face.

ii) Granular Subbase

- (1) Crushed stone or gravel.
  - (2) Gradations to be within limits specified. Sieve sizes to CAN/CGSB-8.1.
- (a) Granular Subbase

Sieve Designation	% Passing
100 mm	-
75 mm	100
50 mm	-
37.5 mm	-
25 mm	55-100
19 mm	-
12.5 mm	-
9.5 mm	-
4.75 mm	25-100
2.00 mm	15-80
0.425 mm	4-50
0.180 mm	-
0.075 mm	0-8

- (b) Los Angeles degradation: to ASTM C131 . Max. % loss by weight: 45
- (c) Crushed particles: at least 60 % of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face.

**3) Execution**

**a) PREPARATION**

- i) Temporary Erosion and Sedimentation Control:
  - (1) Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
  - (2) Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

**b) PLACEMENT AND INSTALLATION**

- i) Place granular base after sub-base surface is inspected and approved by Departmental Representative.
- ii) Placing:

- (1) Construct granular base and subbase to depth and grade in areas indicated.
- (2) Ensure no frozen material is placed.
- (3) Place material only on clean unfrozen surface, free from snow and ice.
- (4) Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- (5) Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- (6) Remove and replace that portion of layer in which material becomes segregated during spreading.

iii) Compaction Equipment:

- (1) Ensure compaction equipment is capable of obtaining required material densities.

iv) Compacting:

- (1) Compact to density not less than 100 % corrected maximum dry density
- (2) Shape and roll alternately to obtain smooth, even and uniformly compacted base and subbase.
- (3) Apply water as necessary during compacting to obtain specified density.
- (4) In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.
- (5) Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

**c) SITE TOLERANCES**

- i) Finished base surface to be within plus or minus 10mm of established grade and cross section but not uniformly high or low.

**d) CLEANING**

- i) Leave Work area clean at end of each day.

**e) PROTECTION**

- i) Maintain finished base in condition conforming to this Section until succeeding material is applied.

**END OF SECTION**

Approved: 2011-06-30

## 1) General

### a) RELATED REQUIREMENTS

- i) 01 00 00 – GENERAL REQUIREMENTS
- ii) 01 33 00 – SUBMITTAL PROCEDURES
- iii) 01 35 29.06 – HEALTH AND SAFETY REQUIREMENTS

### b) MEASUREMENT AND PAYMENT

- i) Asphalt paving will be measured to ensure design depths and installation requirements have been met, but will be paid as a lump sum item and not measured separately for payment.

### c) REFERENCE STANDARDS

- i) American Association of State Highway and Transportation Officials (AASHTO)
  - (1) AASHTO M320- [10], Standard Specification for Performance Graded Asphalt Binder.
  - (2) AASHTO R29-02, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.
  - (3) AASHTO T245-97(2004), Standard Method of Test for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.
- ii) ASTM International
  - (1) ASTM D995--95b (2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

### d) ACTION AND INFORMATIONAL SUBMITTALS

- i) Product Data:
  - (1) Submit manufacturer's instructions, printed product literature and data sheets for asphalt mixes and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.

## 2) Products

### a) MATERIALS

- i) Performance graded asphalt cement: to AASHTO M320, grade PG 28 58 when tested to AASHTO R29.
- ii) Aggregates: in accordance with requirements as follows:
  - (1) Gradation Table

(2) Table:

Sieve Designation	% Passing	
Lower Course	Surface Course	Sheet Asphalt
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	100	-
19 mm	-	-
12.5 mm	70-85	100
9.5 mm	-	-
4.75 mm	40-65	55-75
2.00 mm	30-50	35-55
0.425 mm	15-30	15-30
0.180 mm	5-20	5-20
0.075 mm	3-8	3-8

- (3) Coarse aggregate: aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C136.
- (4) Magnesium Sulphate soundness: to ASTM C88 . Max % loss by mass:
- (a) Coarse aggregate surface course: 12%.
  - (b) Coarse aggregate lower course: 12%.
  - (c) Fine aggregate, surface course: 16%.
  - (d) Fine aggregate, lower course: 16%.
- (5) Los Angeles degradation: Grading B, to ASTM C131. Max % loss by mass:
- (a) Coarse aggregate, surface course: 25%.
  - (b) Coarse aggregate, lower course: 35%.
- (6) Absorption: to ASTM C127. Max % by mass:
- (a) Coarse aggregate, surface course: 1.75%.
  - (b) Coarse aggregate, lower course: 2.00%.
- (7) Loss by washing: to ASTM C117. Max % passing 0.075 mm sieve:
- (a) Coarse aggregate, surface course: 1.5%.
  - (b) Coarse aggregate, lower course: 2.0%.
- (8) Lightweight particles: to ASTM C123. Max % by mass less than 1.95 relative density:
- (a) Surface course: 1.5%.
  - (b) Lower course: 3.0%.
- (9) Flat and elongated particles: to ASTM D4791, (with length to thickness ratio greater than 5): Max % by mass:
- (a) Coarse aggregate, surface course: 15%.
  - (b) Coarse aggregate, lower course: 15%.

- (10) Crushed fragments: at least 60% of particles by mass within each of following sieve designation ranges, to have 1 minimum freshly fractured face.
  - (11) Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.
- iii) Mineral filler:
- (1) Ensure finely ground particles of limestone, hydrated lime, Portland cement or non-plastic mineral matter approved by Departmental Representative are thoroughly dry and free from lumps.
  - (2) Add mineral filler when necessary to meet job mix aggregate gradation or as directed by Departmental Representative to improve mix properties.
  - (3) Ensure mineral filler is dry and free flowing when added to aggregate.
- iv) Anti-stripping agent: hydrated lime to ASTM C207 type N.
- (1) Add lime at rate of approximately 2-3% of dry weight of aggregate.
- v) Water: to approval of Departmental Representative.

## **b) EQUIPMENT**

- i) Pavers: mechanical self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- ii) Rollers: sufficient number of type and weight to obtain specified density of compacted mix.
- iii) Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
  - (1) Boxes with tight metal bottoms.
  - (2) Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
  - (3) In cool weather or for long hauls, insulate entire contact area of each truck box.
  - (4) Use only trucks which can be weighed in single operation on scales supplied.
- iv) Hand tools:
  - (1) Lutes or rakes with covered teeth for spreading and finishing operations.
  - (2) Tamping irons having mass 12 kg minimum and bearing area not exceeding 310 cm<sup>2</sup> for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved, may be used instead of tamping irons.
  - (3) Straight edges, to test finished surface.

## **c) MIX DESIGN**

- i) Mix design to be provided to Departmental Representative.

ii) Mix design to be developed by testing laboratory approved in writing by [Consultant] [DCC Representative] [Departmental Representative] .

iii) Design of mix: by Marshall method to requirements below.

(1) Compaction blows on each face of test specimens: 50.

(2) Mix physical requirements:

Property	Roads	Sheet Asphalt
Marshall Stability at 60 degrees C kN min	5.5 surface course/4.5 lower course	3.0
Flow Value mm	2-4	2-5
Air Voids in Mixture, %	3-5 surface course/2-6 lower course	3-5
Voids in Mineral Aggregate, % min	15 surface course/13 lower course	16
Index of Retained Stability % minimum	75	75

(3) Measure physical requirements as follows:

(a) Marshall load and flow value: to AASHTO T245.

(b) Compute void properties on basis of bulk specific gravity of aggregate to ASTM C127 and ASTM C128 . Make allowance for volume of asphalt absorbed into pores of aggregate.

(c) Air voids: to ASTM D3203.

(d) Voids in mineral aggregates: to AI MS2.

(e) Index of Retained Stability: measure in accordance with Marshall Immersion Test for Bitumen.

(4) Do not change job-mix without prior approval of Departmental Representative.

### 3) Execution

#### a) PLANT AND MIXING REQUIREMENTS

i) Batch and continuous mixing plants:

(1) To ASTM D995.

(2) Feed aggregates from individual stockpiles through separate bins to cold elevator feeders.

(a) Do not load frozen materials into bins.

(3) Feed cold aggregates to plant in proportions to ensure continuous operations.

(4) Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.

- (5) Before mixing, dry aggregates to moisture content not greater than 1% by mass or to lesser moisture content if required to meet mix design requirements.
- (6) Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.
- (7) Store hot screened aggregates in manner to minimize segregation and temperature loss.
- (8) Make available current asphalt cement viscosity data at plant.
- (9) Maintain temperature of materials within 5 degrees C of specified mix temperature during mixing.

ii) Dryer drum mixing plant:

- (1) To ASTM D995 .
- (2) Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.
- (3) Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.
- (4) Meter total flow of aggregate using electronic weigh belt system with indicator that can be monitored by plant operator and which is interlocked with asphalt pump to ensure proportions of aggregate and asphalt entering mixer remain constant.
- (5) Allow for easy calibration of weighing systems for aggregates without having material enter mixer.
- (6) Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
  - (a) Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time.
  - (b) Difference between this value and amount shown by plant computer system to differ by not more than plus or minus[2%.
- (7) Make provision for conveniently sampling full flow of materials from cold feed.
- (8) Provide screens or other suitable devices to reject oversize particles or lumps of aggregate cold feed prior to entering drum.
- (9) Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.
- (10) Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream.
  - (a) Control heating to prevent fracture of aggregate or excessive oxidation of asphalt.

- (b) Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator.
- (c) Submit printed record of mix temperatures at end of each day.
- (11) Ensure mixing period and temperature to produce uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer is 2% maximum.

iii) Temporary storage of hot mix:

- (1) Provide mix storage of sufficient capacity to permit continuous operation and designed to prevent segregation.
- (2) Do not store asphalt mix in storage bins in excess of 3 hour.

iv) While producing asphalt mix for this Project, do not produce mix for other users unless separate storage and pumping facilities are provided for materials supplied to this project.

v) Mixing tolerances:

- (1) Permissible variation in aggregate gradation from job mix (percent of total mass).

4.75 mm sieve and larger	
2.00 mm sieve	
0.425 mm sieve	
0.180 mm sieve	
0.075 mm sieve	[2.0]

- (2) Permissible variation of asphalt cement from job mix: 0.25%.
- (3) Permissible variation of mix temperature at discharge from plant: 5 degrees C.

vi) Addition of anti-stripping agent:

- (1) Plant to be equipped with pug mill to thoroughly mix aggregates and lime prior to entering the plant.
- (2) Plant to be equipped with suitable conveyor systems capable of supplying aggregates and lime at constant rate.
- (3) Plant and equipment used for addition of lime to be equipped with covers to control loss of lime.
- (4) Plant to be equipped to control rate of lime incorporation to within 1/4%.
- (5) Add water to aggregate prior to entering pug mill.
- (6) Add water to lime sufficiently in advance to permit time to slake prior to entering pug mill.

**b) PREPARATION**

i) 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.
  - (2) Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- ii) Prior to laying mix, clean surfaces of loose and foreign material.

**c) TRANSPORTATION OF MIX**

- i) Transport mix to job site in vehicles cleaned of foreign material.
- ii) Paint or spray truck beds with limewater, soap or detergent solution, or non-petroleum based commercial product, at least daily or as required.
  - (1) Raise truck bed and thoroughly drain, and ensure no excess solution remains in truck bed.
- iii) Schedule delivery of material for placing in daylight.
- iv) Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.
  - (1) Do not dribble mix into trucks.
- v) Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.
- vi) Deliver loads continuously in covered vehicles and immediately spread and compact.

**d) PLACING**

- i) Place asphalt concrete to thicknesses, grades and lines shown on Plans.
- ii) Placing conditions:
  - (1) Place asphalt mixtures only when air temperature is 5 degrees C minimum.
  - (2) When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
  - (3) Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
  - (4) Correct irregularities in surface of pavement course directly behind paver.
    - (a) Remove excess material forming high spots using shovel or lute.
      - (i) Fill and smooth indented areas with hot mix.
      - (ii) Do not broadcast material over such areas.
  - (5) Do not throw surplus material on freshly screeded surfaces.
- iii) When hand spreading is used:
  - (1) Use approved wood or steel forms, rigidly supported to assure correct grade and cross section.
    - (a) Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

- (2) Distribute material uniformly without broad casting material.
- (3) During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes.
  - (a) Reject material that has formed into lumps and does not break down readily.
- (4) After placing and before rolling, check surface with templates and straightedges and correct irregularities.
- (5) Provide heating equipment to keep hand tools free from asphalt.
  - (a) Control temperature to avoid burning material.
  - (b) Do not use tools at higher temperature than temperature of mix being placed.

**e) COMPACTING**

- i) Roll asphalt continuously using established rolling pattern for test strip and to density of not less than 100% of maximum density determined for test strip.
- ii) General:
  - (1) Provide as many rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.
  - (2) Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.
  - (3) Operate roller slowly initially to avoid displacement of material.
  - (4) Use static compaction for levelling coarse less than 25 mm thick.
  - (5) For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.
  - (6) Overlap successive passes of roller by minimum of 200 mm and vary pass lengths.
  - (7) Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
  - (8) Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
  - (9) Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
  - (10) After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.
    - (a) Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.
  - (11) When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

- (12) Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

iii) General:

- (1) Remove surplus material from surface of previously laid strip.
  - (a) Do not deposit on surface of freshly laid strip.
- (2) Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

iv) Transverse joints:

- (1) Offset transverse joint in succeeding lifts by at least 600 mm.
- (2) Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.
- (3) Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

v) Longitudinal joints:

- (1) Offset longitudinal joints in succeeding lifts by at least 150 mm.
- (2) Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.
  - (a) If cold joint cannot be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane.
- (3) Overlap previously laid strip with spreader by 25 to 50 mm.
- (4) Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
- (5) Roll longitudinal joints directly behind paving operation.
- (6) When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.

vi) Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix.

- (1) Place and compact joint to ensure joint is smooth and without visible breaks in grade.
- (2) Locate feather joints as indicated.

**f) FINISH TOLERANCES**

- i) Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.
- ii) Finished asphalt surface not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.

**g) DEFECTIVE WORK**

- i) Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.
  - (1) 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.
- ii) Repair areas showing checking, rippling, or segregation.
- iii) Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

**h) CLEANING**

- i) Leave Work area clean at end of each day.

**END OF SECTION**

## 1 General

### .1 RELATED REQUIREMENTS

- .1 01 00 00 – GENERAL REQUIREMENTS
- .2 01 33 00 – SUBMITTAL PROCEDURES
- .3 01 35 29.06 – HEALTH AND SAFETY REQUIREMENTS

### .2 MEASUREMENT PROCEDURES

- .1 Site utility piping will be measured to ensure design materials, lengths, depths and installation requirements have been met, but will be paid as a lump sum item and not measured separately for payment.

### .3 REFERENCE STANDARDS

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .3.1.1 AWWA B301-[10], Standard for Liquid Chlorine.
  - .3.1.2 AWWA B303-[10], Standard for Sodium Chlorite.
  - .3.1.3 AWWA C500-[09], Standard for Metal-Seated Gate Valves for Water Supply Service.
  - .3.1.4 AWWA C800-[05], Standard for Underground Service Line Valves and Fittings.
- .2 Canadian General Standards Board (CGSB)
  - .3.2.1 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
  - .3.2.2 CGSB 41-GP-25M-[77], Pipe, Polyethylene, for the Transport of Liquids.
- .3 CSA International
  - .3.3.1 CAN/CSA-B137 Series-[09], Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
    - .3.3.1.1 CAN/CSA-B137.1-[09], Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.
    - .3.3.1.2 CAN/CSA-B137.3-[09], Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
- .4 ACTION AND INFORMATIONAL SUBMITTALS
  - .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Product Data:
    - .4.2.1 Submit manufacturer's instructions, printed product literature and data sheets for piping materials and include product characteristics, performance criteria, physical size, finish and limitations.

- .4.2.2 Pipe certification to be on pipe.
- .3 Samples:
  - .4.3.1 Submit test samples of bedding and trench backfill material.
  - .4.3.2 Submit manufacturer's test data and certification that pipe materials meet requirements of this section 4 weeks minimum prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .5 DELIVERY, STORAGE AND HANDLING**
  - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .2 Storage and Handling Requirements:
    - .5.2.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
    - .5.2.2 Store and protect water distribution piping from nicks, scratches, and blemishes.
    - .5.2.3 Replace defective or damaged materials with new.

## **2 Products**

- .1 PIPE, JOINTS AND FITTINGS**
  - .1 Underground electrical ducts: rigid type, size as indicated.
  - .2 Storm drainage pipe: Poly Vinyl Chloride (PVC): to CAN/CSA-B1800.
    - .1 Standard Dimensional Ratio (SDR): 28
    - .2 Integral bell and spigot system
  - .1 Polyethylene pressure pipe:
    - .1.1.1 NPS 1/2 to NPS 6: to ASTM F714, type PE 3408, DR 11
    - .1.1.2 Polyethylene to polyethylene joints: to be thermal butt fusion joined, to ASTM D2657.
    - .1.1.3 Stub end flanged ends to have stainless steel backing flanges.
    - .1.1.4 Polyethylene fittings: to CAN/CSA-B137.1, for pipe sizes NPS 4 and less.
    - .1.1.5 Electrical, Telus and Shaw conduit to be 100mm diameter Rigid PVC, grey- CSA DB2 as per CSA C22.2, No. 2111.1, M1984 in accordance with BCHydro's underground installation manual.
- .2 VALVES AND VALVE BOXES**
  - .1 Valves to open clockwise.
  - .2 Gate valves: bronze valves with non-rising stems, suitable for 1 Pa.

- .3 Underground type indicator valve where indicated. Indicator post to accurately indicate valve open or closed.
- .4 Cast iron valve boxes: three piece sliding type, adjustable over minimum of 450 mm, complete with extension rod of such length that when set on valve operating nut top of rod will not be more than 150 mm below cover.

**.3 PIPE BEDDING AND SURROUND MATERIAL**

- .1 Granular material meeting the following:
  - .3.1.1 Crushed or screened stone, gravel or sand.
  - .3.1.2 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1.

.3.1.3 Table

Sieve Designation	% Passing	
	Type 1	Type 2
Stone/Gravel		
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	[100]	-
19 mm	-	-
12.5 mm	[65-90]	[100]
9.5 mm	-	-
4.75 mm	[35-55]	[80-100]
2.00 mm	-	[50 - 90]
0.425 mm	[10-25]	[10 - 50]
0.180 mm	-	-
0.075 mm	[0 - 8]	[0 - 10]

**.4 BACKFILL MATERIAL**

- .1 Backfill with excavated material.

**.5 POTABLE WATER PIPE DISINFECTION**

- .1 Sodium chlorite, Liquid chlorine, Calcium hypochlorite, to B303, AWWA B300, AWWA B301, respectively, to disinfect water mains.
- .2 Disinfect water mains in accordance with AWWA C651.

**3 Execution**

**.1 CONFIRMATION OF LOCATION**

- .1 Confirm location of appurtenances and fittings with Departmental Representative before proceeding.

**.2 PREPARATION**

- .1 Clean pipes, fittings, valves and appurtenances of accumulated debris and water before installation.
  - .2.1.1 Inspect materials for defects to approval of Departmental Representative.
  - .2.1.2 Remove defective materials from site and replace.

**.3 TRENCHING**

- .1 Ensure trench depth allows coverage over pipe of 0.7m minimum from finished grade, or as indicated on the Plans.
- .2 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

**.4 GRANULAR BEDDING**

- .1 Place granular bedding material in uniform layers not exceeding 150mm compacted thickness to depth of 100mm below bottom of pipe.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 95 % minimum of corrected maximum dry density to ASTM D698.

**.5 PIPE INSTALLATION**

- .1 Install potable water pipes to AWWA C600, and manufacturer's standard instructions and specifications.
- .2 Join pipes in accordance with manufacturer's recommendations.
- .3 Electrical ducting to be installed in accordance with BCHydro's underground installation manual.
- .4 Lay pipes on prepared bed, true to line and grade.
  - .5.4.1 Correct pipe which is not in true alignment or grade.
- .5 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .6 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
- .7 Position and join pipes with equipment and methods approved by Departmental Representative.
- .8 All welds to polyethylene piping to be done by certified polyethylene pipe welder.
- .9 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating.

- .10 Align pipes before jointing.
- .11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .12 Avoid displacing gasket or contaminating with dirt or other foreign material.
  - .5.12.1 Remove disturbed or contaminated gaskets.
  - .5.12.2 Clean, lubricate and replace before jointing is attempted again.
- .13 Complete each joint before laying next length of pipe.
- .14 Minimize deflection after joint has been made.
- .15 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .16 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .17 Do not lay pipe on frozen bedding.
- .18 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.
- .19 Backfill remainder of trench, and compact in 600mm lifts.
- .6 VALVE INSTALLATION**
  - .1 Install valves to manufacturer's recommendations at locations as indicated.
  - .2 Support valves located in valve boxes or valve chambers by means of bedding.
- .7 THRUST BLOCKS AND RESTRAINED JOINTS**
  - .1 Place concrete thrust blocks on piping 100mm or larger between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated, or as directed by Departmental Representative.
  - .2 Keep joints and couplings free of concrete.
  - .3 Do not backfill over concrete within 12 hours after placing.
- .8 HYDROSTATIC AND LEAKAGE TESTING**
  - .1 Do tests on potable water pipes in accordance with AWWA C600.
  - .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
  - .3 Notify Departmental Representative at least 24 hours in advance of proposed tests.
    - .8.3.1 Perform tests in presence of Departmental Representative.
  - .4 Leave hydrants, valves, joints and fittings exposed.

- .5 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.
  - .6 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
  - .7 Open valves.
  - .8 Expel air from main by slowly filling main with potable water.
  - .9 Thoroughly examine exposed parts and correct for leakage as necessary.
  - .10 Apply hydrostatic test pressure of 100 psi minimum for period of 1 hour.
  - .11 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.
  - .12 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
  - .13 Repeat hydrostatic test until defects have been corrected.
  - .14 Apply leakage test pressure of 100psi minimum after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 1 hour.
  - .15 Zero leakage is acceptable in welded polyethylene piping.
  - .16 Repeat test until leakage is within specified allowance for full length of piping.
- .9 PIPE SURROUND**
- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
  - .2 Hand place surround material in uniform layers not exceeding 150mm compacted thickness as indicated.
  - .3 Place layers uniformly and simultaneously on each side of pipe.
  - .4 Do not place material in frozen condition.
  - .5 Compact in layers no greater than 150mm.
- .10 BACKFILL**
- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
  - .2 Do not place backfill in frozen condition.
  - .3 Compact backfill to at least 95% corrected maximum dry density.