

# **Specifications**

**Issued for Tender**

## **Cape Spear NHSC World War II Battery Rehabilitation**

**Blackhead Road / Route 11**

**Cape Spear, NL**

**PROJECT NO. 446**

**PARKS CANADA**

August 31, 2016

DISCIPLINE

DATE

STAMP

Structural  
Specifications:

Aug 31, 2016



Civil  
Specifications:

Aug 31, 2016



Electrical  
Specifications:

Aug 31, 2016



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END OF SECTION

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**Part 1            General**

**1.1                DESCRIPTION OF WORK**

- .1     The Work of the Project is defined by the Contract Documents and generally involves the remediation of the WWII Battery Structure that includes but is not limited to the following:
  - .1     Mobilization, start-up planning and scheduling, material order, supply and delivery, and site control and access, temporary access routes, site vegetation contamination controls and preservation of site conditions.
  - .2     Earthworks including clearing, grubbing, soil and rock excavation, earth stock pile, and reinstatement.
  - .3     Install new drainage system and repair/replace existing drainage system.
  - .4     Repair or replace catch basins as indicated on drawings.
  - .5     Remove decks and wheel chair access as indicated on drawings.
  - .6     Install waterproofing on all new and existing to remain concrete surfaces. Remove and replace gun emplacement canopies flashing with all new flashing and new flashing at tunnel entrances.
  - .7     Concrete repairs for all existing to remain surfaces including crack injection, surface repairs, and rebar reinforcement
  - .8     Remove and replace noted tunnels with new precast concrete sections including section design. Tie in's to the existing structure to be cast in place concrete with dowels and rebar as noted. Includes all site preparation and unit moving and placement requirements.
  - .9     Install new precast concrete tunnel entrance on the north of magazine #4 including section design. Install new concrete access stairs and handrail. Includes all site preparation and unit moving and placement requirements.
  - .10    Remove and replace all ready room and magazine ventilation shafts.
  - .11    Remove, repair, replace, and install new electrical components.
  - .12    Site cleanup and reinstatement to original conditions as specified by departmental representative.
  - .13    Demobilization.
- .2     Type of Contract
  - .1     Project will be constructed under a combined lump sum and unit price contract.

**1.2                PROJECT INFORMATION**

- .1     Project Identification: Cape Spear NHSC World War II Battery Rehabilitation, Parks Canada, Cape Spear, NL.
  - .1     Project Location: Blackhead Road / Route 11, Cape Spear, NL
- .2     Tenant: Parks Canada

### **1.3 FAMILIARIZATION WITH SITE**

- .1 Before submitting a bid, it is recommended that bidders visit the site to review and verify the form, nature and extent of the work, materials needed, the means of access and the temporary facilities required to perform the Work.
- .2 Obtain prior permission from the Departmental Representative before carrying out such

### **1.4 CODES AND STANDARDS**

- .1 Perform work in accordance with the National Building Code of Canada (NBC) 2015 and National Fire Code of Canada (NFC) 2015 and NFPA 101-2012 Life Safety Code and NFPA 1-2012 Fire Code, and any other code of provincial or local application, including all amendments up to bid closing date, provided that in any case of conflict or discrepancy, the more stringent requirement shall apply.
- .2 Materials and workmanship must meet or exceed requirements of specified standards, codes and referenced documents.

### **1.5 ARCHEOLOGICAL DISCOVERIES**

- .1 Preservation of the historic landscape and all historically significant aspects must be given the highest priority during construction. Compliance with all the Cultural Resource Management recommendations outlined in the AOA are mandatory:
  - .1 The installation of new drainage and electrical systems will require archaeological monitoring during trenching as there will be excavation under and around the battery wall. Although the electrical conduits will be most likely buried above the new drainage system, some electrical infrastructure locations still need to be defined and may be buried outside the drainage footprint.
  - .2 The installation of new waterproofing membrane around and over the battery walls will require archaeological monitoring during excavation and fill removal and archaeological recording of the features brought to light. It is important to document the walls, roofing, foundations, and construction techniques of the battery as well as the different fills used to cover its structure.
  - .3 The replacement of tunnel sections with precast box culvert will required large scale archaeological recording (pictures, scale drawings, GPS coordinates) of every feature seen in situ before their removal and replacement. Then, the archaeological features and/or soils found underneath and/or behind the removed/replaced sections will need to be properly recorded. Archaeological monitoring will be required during excavation above/around the north entrance of the battery.
- .2 Should unexploded ammunition be discovered stop work immediately and notify the designated Parks Canada contact.
- .3 If cultural or archaeological resources are encountered, work must cease in the immediate area and, Martin Perron (Tel: 819-420-9558) and Virginia Sheehan (Tel: 819-420-9213), Parks Canada, notified immediately. If features (i.e., structural remains and/or artifact concentrations) are encountered, leave in place, mark the location (e.g. with prominent flagging) and do not disturb prior to archaeological assessment of nature and significance.



## **1.6 INTERPRETATION OF DOCUMENTS**

- .1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

## **1.7 TERM ENGINEER**

- .1 Unless specifically stated otherwise, the term Engineer where used in the Specifications and on the Drawings shall mean the Departmental Representative as defined in the General Conditions of the Contract.

## **1.8 SETTING OUT WORK**

- .1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .2 Provide devices needed to lay out and construct work.
- .3 Supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.
- .4 Supply stakes and other survey markers required for laying out work.

## **1.9 COST BREAKDOWN**

- .1 Before submitting first progress claim submit breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating contract amount. Required forms will be provided for application of progress payment.
- .2 List items of work numerically following the same division/section number system of the specification manual and thereafter sub-divide into major work components and building systems as directed by Departmental Representative.
- .3 Upon approval, cost breakdown will be used as basis for progress payment.

## **1.10 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each of the following:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda and amendments.
  - .4 Reviewed Shop Drawings.
  - .5 List of outstanding shop drawings.
  - .6 Change Orders.
  - .7 Other modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and other safety related documents.
  - .11 Other documents as stipulated elsewhere in the Contract Documents.

### **1.11 PERMITS**

- .1 In accordance with the General Conditions, obtain and pay for building permit, certificates, licenses and other permits as required by municipal, provincial and federal authorities.
- .2 Provide appropriate notifications of project to municipal and provincial inspection authorities.
- .3 Obtain compliance certificates as prescribed by legislative and regulatory provisions of municipal, provincial and federal authorities as applicable to the performance of work.
- .4 Submit to Departmental Representative, copy of application forms and approval documents received from above referenced authorities.

### **1.12 COORDINATION WITH OCCUPANTS**

- .1 Partial Tenant Occupancy: Tenant will occupy the premises during entire construction period, with the exception of areas under construction. Coordinate with Departmental Representative during construction operations to minimize conflicts and facilitate Tenant usage. Perform the Work so as not to interfere with Tenant's operations. Maintain existing exits unless otherwise indicated.
  - .1 The site will remain open to the public throughout the duration of the Contract. Coordinate with Departmental Representative to minimize interference with public use of areas not under construction.
  - .2 Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Departmental Representative and authorities having jurisdiction.
  - .3 Provide not less than 72 hours' notice to Departmental Representative of activities that will affect Tenant's operations.
  - .4 Any work that requires access to an area of the building or site that the Tenant or public have access to must occur after Tenant's regular work hours. Contractor is to ensure area is left in its original state for Tenant's use the next day.

### **1.13 ACCESS TO SITE**

- .1 General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
  - .1 Please note that limited on-site parking is available for Contractor or its employees. Contractor is responsible for finding off-site parking as required.
- .2 Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - .1 Limits: Where the Work involves site work, limit site disturbance, including earthwork and clearing of vegetation, to 12.2 m beyond building perimeter; 3 m beyond surface walkways, patios, surface parking, and utilities less than 300 mm in diameter; 4.5 m beyond primary roadway curbs and main utility branch trenches; and 7.6 m beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that

require additional staging areas in order to limit compaction in the constructed area. Unless stated otherwise by the Departmental Representative.

- .2 Driveways, Walkways and Entrances: For Work involving renovations to an existing structures or adjacent to other buildings then keep driveways and loading areas, and entrances serving premises clear and available to Tenant, Tenant's employees, and emergency vehicles at all times. **Do not use these areas for parking or storage of materials unless it is a designated zone agreed to by the Project Manager.**

- .1 Schedule deliveries to minimize use of driveways and entrances by construction operations.
- .2 Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

- .3 Condition of Existing Structure: Where the Work involves work on an existing structure, Maintain portions of the existing building affected by construction operations in a weather tight condition throughout construction period. Repair damage caused by construction operations.

#### **1.14 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Where security has been reduced by work of Contract, provide temporary means to maintain security.
- .3 Provide temporary dust screens, barriers, warning signs in locations where renovation and alteration work is adjacent to areas which will be operative during such work.

#### **1.15 ROUGHING-IN**

- .1 Be responsible for obtaining manufacturer's literature and for correct roughing-in and hook-up of equipment, fixtures and appliances.

#### **1.16 CUTTING, FITTING AND PATCHING**

- .1 Ensure that cutting and patching required by all trades is included in total bid amount submitted for the work.
- .2 Execute cutting including excavation, fitting and patching required to make work fit properly.
- .3 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work. This includes patching of openings in existing work resulting from removal of existing services.
- .4 Do not cut, bore, or sleeve load-bearing members, except where specifically approved by Departmental Representative.
- .5 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .6 Fit work airtight to pipes, sleeves ducts and conduits.

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**1.17 CONCEALMENT**

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

**1.18 LOCATION OF FIXTURES**

- .1 Location of equipment, fixtures and outlets, shown or specified shall be considered as approximate. Actual location shall be as required to suit conditions at time of installation and as is reasonable.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative when impending installation conflicts with other new or existing components. Follow directives for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

**1.19 EXISTING SERVICES**

- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to pedestrian, vehicular traffic and tenant operations.
- .2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.
- .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility. This includes disconnection of electrical power and communication services to tenant's operational areas. Adhere to approved schedule and provide notice to affected parties.
- .4 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
- .5 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .6 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services as required. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction over service. Record locations of maintained, re-routed and abandoned service lines.

**1.20 BILINGUAL NOTATIONS**

- .1 Any items supplied and installed under this contract which have operating instructions on them such as door hardware, mechanical equipment, etc., and which can be expected to be used by the public and building tenants, must have such operating instructions in bilingual format - English and French.
- .2 Factory embossed or recessed symbols illustrating equipment operation is an acceptable alternate to lettering.

- .3 Items supplied with factory - embossed or recessed lettering in one official language with an applied sticker or decal representing the second official language is not acceptable unless the Departmental Representative gives prior approval before any such items are ordered.
- .4 Internationally recognized colour coding such as red and blue center pieces for plumbing brass is acceptable.
- .5 No extra costs will be paid for re-stocking or re-ordering of materials and equipment due to Contractor's failure to fully meet bilingual signage requirements specified herein.
- .6 Ensure that all trades are made aware of above requirements.

**1.21 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions.

**1.22 ASBESTOS DISCOVERY**

- .1 Demolition of spray or trowel-applied asbestos can be hazardous to health. Should material resembling spray or trowel-applied asbestos be encountered in course of work, stop work and notify Departmental Representative immediately. Do not proceed with relevant work until written instructions have been received from Departmental Representative.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUBMITTALS**

- .1 Upon award of contract and prior to commencement of work, submit to Departmental Representative the following work management documents:
  - .1 Work Schedule as specified herein.
  - .2 Shop Drawing Submittal Schedule
  - .3 Waste Management Plan.
  - .4 Health and Safety Plan.
  - .5 Hot Work Procedures.
  - .6 Lockout Procedures.
  - .7 Dust Control Plan.
  - .8 List of workers requiring security clearance and those to be placed on Site Security Control list.
  - .9 Public Access Plan.
  - .10 Erosion and Sediment Control Plan.

**1.2 WORK SCHEDULE**

- .1 Upon acceptance of bid submit:
  - .1 Detailed work schedule submitted within 7 calendar days.
- .2 Schedule to indicate all calendar dates from commencement to completion of all work within the time stated in the accepted bid. Schedule to include Tenant operations outlined in Section 01 10 10.
- .3 Provide sufficient details in detailed schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.
- .4 Detailed work schedule content to include as a minimum the following:
  - .1 Bar (GANTT) Charts, indicating all work activities, tasks and other project elements, their anticipated durations, planned dates for achieving key activities and major project milestones supported with;
  - .2 Written narrative on key elements of work illustrated in bar chart, providing sufficient details to demonstrate a reasonable implementation plan for completion of project within designated time.
  - .3 Generally Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.

- .5 Schedule work in cooperation with the Departmental Representative. Incorporate within Detailed Work Schedule, items identified by Departmental Representative during review of preliminary schedule.
- .6 Completed schedule shall be approved by Departmental Representative. When approved, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.
- .7 Ensure that all subtrades and subcontractors are made aware of the work restraints and operational restrictions specified.
- .8 Schedule Updates:
  - .1 Submit on a monthly basis.
  - .2 Provide information and pertinent details explaining reasons for necessary changes to implementation plan.
  - .3 Identify problem areas, anticipated delays, impact on schedule and proposed corrective measures to be taken.
- .9 Departmental Representative will make interim reviews and evaluate progress of work based on approved schedule. Frequency of such reviews will be as decided by Departmental Representative. Address and take corrective measures on items identified by reviews and as directed by Departmental Representative. Update schedule accordingly.
- .10 In every instance, change or deviation from the Work Schedule, no matter how minimal the risk or impact on safety or inconvenience to tenant or public might appear, will be subject to prior review and approval by the Departmental Representative.

### **1.3 PROJECT PHASING**

- .1 Be aware that Facility must be kept operational for the full duration of work of this contract.
- .2 Unless indicated or approved otherwise, complete all work of a particular phase prior to commencement of another phase. Obtain Departmental Representative's permission prior to moving between phases

### **1.4 OPERATIONAL RESTRICTIONS**

- .1 The Contractor must recognize that site occupants will be affected by implementation of this Contract. The Contractor must perform the work with utmost regard to the safety and convenience of site occupants and users. All work activities must be planned and scheduled with this in mind. The Contractor will not be permitted to disturb any portion of the site without providing temporary facilities as necessary to ensure safe and direct passage through disturbed or otherwise affected areas.
- .2 Contractor to ensure locations of underground services are identified and prevent impact by heavy equipment.

- .3 Contractor to meet with the Departmental Representative on a weekly basis to identify intended work areas, activities and scheduling for the coming week.
- .4 Limited Maneuvering Space on Site:
  - .1 The Contractor's access to site will be limited to area of work.
  - .2 Control points to be relocated/ installed as part of this project.
- .5 Facility circulation maintained:
  - .1 Ensure that entrances, corridors, and other circulation routes are maintained free and clear providing safe and uninterrupted passage for Facility users and public at all times during the entire work.
  - .2 Maintain those areas clean and free of construction materials and equipment. Provide temporary suitable enclosures to ensure users are not exposed to construction activities and are protected from exposure to dust, noise, and hazardous conditions.
  - .3 Provide temporary corridors, walkways, passageways, etc. when required due to nature of work. Such circulation routes must be constructed to barrier free requirements unless approved otherwise by Departmental Representative.
  - .4 Maintain fire escape routes accessible and fire fighting access open all times for the duration of the project.
- .6 To assure that construction work may proceed productively without risk to safety of site occupants, be aware that certain work of this contract must be carried out during "Off-Hours".
- .7 The following work, if necessary, shall be performed during Off-Hours:
  - .1 Any work undertaken in the corridor.
  - .2 Asbestos removal.
  - .3 Erection and dismantling of hoarding or other protective devices to separate areas of Facility occupied and under use by public and tenants from work areas;
  - .4 Erection of site enclosure fencing and temporary hoarding at site entrances to keep them operational during work;
  - .5 Asbestos abatement;
  - .6 Demolition of any masonry or concrete;
  - .7 All work involving saw cutting or boring of openings through masonry and concrete walls, floors, ceilings or roof;
  - .8 Work which requires the use of products controlled by WHMIS and for which MSDS sheets indicate toxic or hazardous materials requiring special handling and application procedures;
  - .9 Use of materials having high solvent content or other content emitting strong noxious fumes or odours;
  - .10 Painting;
  - .11 Removal of demolition debris from the site, including cleaning of premises;
  - .12 Cleaning and preparing of occupied areas for daytime use by tenants immediately following an off-hour work shift;



- .13 Work within a tenant occupied area including corridors, and other circulation routes under use;
  - .14 Work which requires the temporary disconnection of power and communication services to occupied areas;
  - .15 Testing of fire alarms and other emergency annunciating system;
  - .16 Delivery of materials and equipment from exterior to the interior of building when access routes are located in tenant occupied spaces.
  - .17 Work which creates excessive noise or vibration creating interference with tenant operations.
- .8 Off Hours: The site could be accessed by the public 24 hours a day, 7 days a week and the Contractor shall be responsible for site security throughout however for the purposes of this contract, "off-hours" are defined as follows:
- .1 Weeknight Hours: between the hours of 18:00 and 07:00 for each weekday Monday to Friday inclusive.
  - .2 Weekend Hours: between the hours of 18:00 Friday evening to 07:00 Monday morning.
  - .3 Dependent on the nature and location of the construction activity, the day of the week and the time of the year, "off-hours" could be subject to redefinition to start or end at adjusted time periods. Scheduling of "off-hours" work will be subject to approval by the Departmental Representative.
- .9 Traffic Signage:
- .1 Provide road signage as required to facilitate heavy equipment movement and traffic.
- .10 Safety Signage:
- .1 Provide on site, and erect as required during progress of work, proper bilingual signage, mounted on self-supporting stands, warning the public and occupants of construction activities in progress and alerting need to exercise caution in proceeding through disturbed areas of the facility, and directing occupants through any detours which may be required.
  - .2 Signage to be professionally printed and mounted on wooden backing, coloured and to express messages as directed by the Departmental Representative.
  - .3 Generally maximum size of sign should be in the order of 1.0 square metres. Number of signs required will be dependent on number of areas in facility under renovation at any one time.
  - .4 Include costs for the supply and installation of these signs in the bid price.
- .11 Dust and Dirt Control:
- .1 See Section 01 50 00 and 01 74 11 for dust control and cleaning requirements.
  - .2 Effectively plan and implement dust control measures and cleaning activities as an integral part of all construction activities. Review all measures with the Departmental Representative before undertaking work, especially for major dust generating activities.

- .3 Do not allow demolition debris and construction waste to accumulate on site and contribute to the propagation of dust.
  - .4 As work progresses, maintain construction areas in a tidy condition at all times. Remove gross dust accumulations by cleaning and vacuuming immediately following the completion of any major dust generating activity.
  - .5 Immediately remove all debris and dust from within occupied areas as generated by work therein during a given workshift.
  - .6 Avoid situations and practices which results in dust and dirt being brought from the construction areas or from the exterior and tracked into occupied areas used by tenants and the public.
  - .7 Stop workers with soiled footwear from entering building. This includes roofing mechanics and heavy civil workers.
  - .8 Inform workers and make them sensitive to the need for dust and dirt control. Stringently enforce rules and regulations, immediately address non-compliance.
  - .9 Keep access doors to work areas closed at all times. Use only designated doors for entry or egress.
- .12 Work in Occupied Areas:
- .1 Where work must be carried out in an occupied area beyond the boundaries of the enclosed construction site, perform such work during the non-operational off-hour periods of the Facility.
  - .2 Ensure that all dust, dirt, debris, construction waste, materials, tools and equipment are completely removed at the end of each workshift. Clean and reinstate area ready for daytime use by tenant.
  - .3 Conduct work in such a way as to minimize the creation of dust and to avoid contaminating areas beyond the immediate location.
  - .4 Discuss and obtain Departmental Representative's approval beforehand on the type and extent of dust barriers, protective devices and measures needed.
  - .5 Disconnect and reconnect any power and communications systems feeding workstations as required.
  - .6 Clean such areas as well as those corridors and routes used to gain entry and access.
- .13 Cleaning of tenant occupied areas used by Contractor:
- .1 Clean stairs, and other circulation routes used by workers to gain access to work by conducting cleaning of floors, walls and other soiled surfaces.
  - .2 Meager attempts at controlling dust and ineffective unprofessional cleaning procedures will not be tolerated.
  - .3 Failure to provide effective dust control, allowing construction dust and dirt to escape beyond construction areas and contaminate occupied areas and building circulation areas will result in Contractor being ordered to immediately provide professional cleaning services without delay to remedy the situation and conduct all cleaning to the extent as determined by Departmental Representative. Alternatively, Departmental Representative may, at certain times and at own discretion; obtain the services of an independent building cleaning agency when cleaning being provided by Contractor is ineffective or tardy in response. Costs

of such services will be charged against Contractor in the form of financial penalties or holdback assessments against the Contract.

- .14 Ensure that all sub-trades are made aware of and abide by the contents of this section and in particularly the work restrictions specified herein due to tenant operational requirements.

## **1.5 PROGRESS MEETINGS**

- .1 Refer to Section 01 31 19 – Progress Meetings.

## **1.6 WORK COORDINATION**

- .1 The General Contractor is responsible for coordinating the work of the various trades and predetermining where the work of such trades interfaces with each other.
  - .1 Designate one person from own employ having overall responsibility to review contract documents and shop drawings, plan and manage such coordination.
- .2 The General Contractor shall convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas and the extent of where interfacing is required.
  - .1 Provide each trade with the plans and specs of the interfacing trade, as required, to assist them in planning and carrying out their respective work.
  - .2 Develop coordination drawings when deemed required illustrating potential interference between works of various trades and distribute to all affected parties including structural trade.
    - .1 Pay particularly close attention to overhead and within or near to building structural elements.
    - .2 Coordination drawings to identify all elements, services lines, rough-in points and indicate from where various services are coming.
  - .3 Review coordination drawings at purposely called meetings. Have subcontractors sign-off on drawings and publish minutes of each meeting.
  - .4 Plan and coordinate work in such a way to minimize quantity of service line offsets.
  - .5 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.
- .3 Submission of shop drawings and ordering of prefabricated equipment or prebuilt components shall only occur once coordination meeting for such items has taken place between trades and all conditions affecting the work of the interfacing trades has been made known and accounted for.
- .4 Work Cooperation:
  - .1 Ensure cooperation between trades in order to facilitate the general progress of the work and avoid situations of spatial interference.
  - .2 Ensure that each trade provides all other trades reasonable opportunity for the completion of the work and in such a way as to prevent unnecessary delays, cutting, patching and the need to remove and replace completed work.

- .5 No extra costs to the Contract will be considered by the Departmental Representative as a result of Contractor's failure to effectively coordinate all portions of the Work. Disputes between the various trades as a result of their not being informed of the areas and extent of interface work shall be the sole responsibility of the General Contractor to be resolved at own cost.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 ADMINISTRATIVE**

- .1 Contractor will schedule and administer project meetings throughout the progress of the work.
- .2 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative and Consultant.
- .3 Provide physical space and make arrangements for meetings.
- .4 Preside at meetings.
- .5 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .6 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants.
- .7 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.2 PRECONSTRUCTION MEETING**

- .1 Within 7 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work: in accordance with Section 01 14 10 – Scheduling and Management of Work
  - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 50 00 - Temporary Facilities.
  - .5 Delivery schedule of specified equipment.
  - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .7 Departmental Representative provided products.
  - .8 Basic Impact Analysis and environmental considerations.
  - .9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

- .11 Take-over procedures, acceptance, warranties in accordance with Section 01 77 00 – Closeout Procedures and 01 78 00 - Closeout Submittals.
- .12 Monthly progress claims, administrative procedures, photographs, hold backs.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.

### **1.3 PROGRESS MEETINGS**

- .1 Schedule project meetings, held on a minimum bi-weekly basis, for entire duration of work and more often when directed by Departmental Representative as deemed necessary due to progress of work or particular situation.
- .2 Contractor, major Subcontractors involved in Work, Departmental Representative are to be in attendance.
- .3 Notify parties minimum 4 days prior to meetings.
  - .1 Ensure attendance of all subcontractors.
  - .2 Departmental Representative will provide list of other attendees to be notified.
- .4 Hold meetings at project site or where approved by Departmental Representative.
- .5 Preside at meetings and record minutes indicating significant proceedings and decisions. Minutes will identify action items by parties.
  - .1 Distribute to participants by email within 4 calendar days after each meeting.
  - .2 Make revisions as directed by Departmental Representative.
- .6 Prepare agenda for meetings. Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

**Part 3            EXECUTION**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 SUMMARY**

- .1 Types of items described in this Section:
  - .1 Administrative and procedural requirements for the following:
    - .1 Preconstruction photographs.
    - .2 Periodic construction photographs.
  - .2 Types of items you will not find described in this Section:
    - .1 Procedures for submitting photographic documentation.
    - .2 Procedures for submitting photographic documentation as project record documents at project closeout.
    - .3 Submitting video recordings of demonstration of equipment and training of Canada personnel.
    - .4 Photographic documentation before demolition operations commence.
    - .5 Photographic documentation before site clearing operations commence.

### **1.2 SUBMITTALS**

- .1 Digital Photographs: Submit image files within three days of taking photographs.
  - .1 Identification: Provide the following information with submission:
    - .1 Name of Project.
    - .2 Name of Contractor.
    - .3 Date photograph was taken.
    - .4 Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

### **1.3 USAGE RIGHTS**

- .1 Obtain and transfer copyright usage rights from photographer to Canada for unlimited reproduction of photographic documentation.

## **Part 2 PRODUCTS**

### **2.1 PHOTOGRAPHIC MEDIA**

- .1 Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 6 megapixels.



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**Part 3 EXECUTION**

**3.1 CONSTRUCTION PHOTOGRAPHS**

- .1 Restrictions: Notwithstanding the requirements listed below, there are strict security restrictions on the use of cameras in and around the site. Departmental Representative will advise on these restrictions at the construction start up meeting.
- .2 General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
- .3 Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - .1 Date and Time: Include date and time in file name for each image.
  - .2 Field Office Images: Maintain one set of images accessible in any field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Departmental Representative.
- .4 Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Departmental Representative.
  - .1 Take not less than 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - .2 Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- .5 Periodic Construction Photographs: Take not less than 20 photographs monthly, coinciding with the cut-off date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- .6 Departmental Representative-Directed Construction Photographs: From time to time, Departmental Representative will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Types of items described in this Section:
  - .1 Requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- .2 Types of items you will not find described in this Section:
  - .1 Requirements for submitting applications for payment and the schedule of values.
  - .2 Requirements for submitting schedules and reports, including contractor's construction schedule.
  - .3 Requirements for submitting operation and maintenance manuals.
  - .4 Requirements for submitting record drawings, record specifications, and record product data.
  - .5 Requirements for submitting video recordings of demonstration of equipment and training of Canadas personnel.

**1.2 DEFINITIONS**

- .1 Action Submittals: Written and graphic information and physical samples that require Departmental Representative's responsive action. Action submittals are those submittals indicated in individual Specification Sections as *action submittals*.
- .2 Informational Submittals: Written and graphic information and physical samples that do not require Departmental Representative's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as *informational submittals*.
- .3 Portable Document Format (PDF): a digital file format licensed by Adobe and other software developers and used to display and print information in a consistent format regardless of computer operating system, monitor, or printer.
- .4 Days: Days of the week, excluding Saturday, Sunday, and any statutory holidays.

**1.3 ACTION SUBMITTALS**

- .1 Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Departmental Representative and additional time for handling and reviewing submittals required by those corrections.
  - .1 Coordinate submittal schedule with list of subcontracts, and Contractor's construction schedule.

- .2 Submit Submittal Schedule concurrently with the first complete submittal of Contractor's construction schedule.
- .3 Format: Arrange the following information in a tabular format:
  - .1 Scheduled date for first submittal.
  - .2 Specification Section number and title.
  - .3 Submittal category: Action; informational.
  - .4 Name of subcontractor.
  - .5 Description of the Work covered.
  - .6 Scheduled date for Departmental Representative's final release.
  - .7 Scheduled date of fabrication.

#### **1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS**

- .1 Digital Data Files: Electronic CAD files of the Contract Drawings are available upon request from the Departmental Representative for the Contractor's use in preparing submittals.
  - .1 Available files:
    - .1 Floor plans.
    - .2 Reflected ceiling plans.
  - .2 Departmental Representative makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
  - .3 Digital Format: Files will be provided in the format generated by the drawing software used to produce the drawing.
- .2 Coordination: Coordinate preparation and processing of submittals with the performance of the construction activities.
  - .1 Coordinate each submittal to accommodate time required for fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - .2 Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - .3 Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  - .4 Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
  - .5 Departmental Representative reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- .3 Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Departmental Representative's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

- .1 Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Departmental Representative will advise Contractor when a submittal being processed must be delayed for coordination.
- .2 Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
- .3 Resubmittal Review: Allow 15 days for review of each resubmittal.
- .4 Electronic Submittals: Place a permanent label or title block on each submittal item for identification.
  - .1 Indicate name of firm or entity that prepared each submittal on label or title block.
  - .2 Include the following information for processing and recording action taken:
    - .1 Project name.
    - .2 Date.
    - .3 Name of Contractor.
    - .4 Name of subcontractor.
    - .5 Name of supplier.
    - .6 Submittal number or other unique identifier, including revision identifier.
      - .1 Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    - .7 Number and title of appropriate Specification Section.
    - .8 Drawing number and detail references, as appropriate.
    - .9 Location(s) where product is to be installed, as appropriate.
    - .10 Other necessary identification.
- .5 Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Departmental Representative may discard submittals received from sources other than Contractor.
  - .1 Transmittal Form for Submittals: Provide locations on form for the following information:
    - .1 Project name.
    - .2 Date.
    - .3 Name of Contractor.
    - .4 Names of subcontractor, manufacturer, and supplier.
    - .5 Category and type of submittal: action or informational as indicated in the applicable Specification Section.
    - .6 Specification Section number and title.
    - .7 Specification paragraph number or drawing designation and generic name for each of multiple items.
    - .8 Drawing number and detail references, as appropriate.
    - .9 Indication of full or partial submittal.

- .10 Transmittal number, if applicable
  - .11 Submittal and transmittal distribution record.
  - .12 Remarks.
  - .13 Signature of transmitter.
- .6 Options: Identify options requiring selection by Departmental Representative.
- .7 Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Departmental Representative on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- .8 Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- .1 Note date and content of previous submittal.
  - .2 Note date and content of revision in label or title block and clearly indicate extent of revision.
  - .3 Resubmit submittals until they are marked with approval notation from Departmental Representative's action stamp.
- .9 Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.
- .10 Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Departmental Representative's action stamp.

## **Part 2 PRODUCTS**

### **2.1 SUBMITTAL PROCEDURES**

- .1 General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- .1 Action Submittals: Submit electronic copy of each submittal unless otherwise indicated.
  - .2 Informational Submittals: Submit electronic copy of each submittal unless otherwise indicated. Departmental Representative will not return copies.
    - .1 Return of Action Submittals: Departmental Representative will return a PDF of a reviewed Submittal via online Construction Contract Administration service. No paper copies will be returned.
- .2 Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

- .1 If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
- .2 Mark each copy of each submittal to show which products and options are applicable.
- .3 Include the following information, as applicable:
  - .1 Manufacturer's catalogue cuts.
  - .2 Manufacturer's product specifications.
  - .3 Standard colour charts.
  - .4 Statement of compliance with specified referenced standards.
  - .5 Testing by recognized testing agency.
  - .6 Application of testing agency labels and seals.
  - .7 Notation of coordination requirements.
  - .8 Availability and delivery time information.
- .4 For equipment, include the following in addition to the above, as applicable:
  - .1 Wiring diagrams showing factory-installed wiring.
  - .2 Printed performance curves.
  - .3 Operational range diagrams.
  - .4 Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- .5 Submit Product Data before or concurrent with Samples.
- .3 Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - .1 Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - .1 Identification of products.
    - .2 Schedules.
    - .3 Compliance with specified standards.
    - .4 Notation of coordination requirements.
    - .5 Notation of dimensions established by field measurement.
    - .6 Relationship and attachment to adjoining construction clearly indicated.
    - .7 Seal and signature of professional engineer if specified.
  - .2 Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets no larger than 11 x 17 in size.
- .4 Samples: Submit Samples for review of kind, colour, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
  - .1 Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - .2 Identification: Attach label on unexposed side of Samples that includes the following:

- .1 Generic description of Sample.
- .2 Product name and name of manufacturer.
- .3 Sample source.
- .4 Number and title of applicable Specification Section.
- .5 Specification paragraph number and generic name of each item.
- .3 Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
  - .1 Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
  - .2 Samples not incorporated into the Work, or otherwise designated as Canada's property, are the property of Contractor.
- .4 Samples for Initial Selection: Submit manufacturer's colour charts consisting of units or sections of units showing the full range of colours, textures, and patterns available.
  - .1 Number of Samples: Submit one full set(s) of available choices where colour, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Departmental Representative will return submittal with options selected.
- .5 Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of colour and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing colour, texture, and pattern; colour range sets; and components used for independent testing and inspection.
  - .1 Number of Samples: Submit two sets of Samples. Departmental Representative will retain one Sample set; remainder will be returned.
  - .2 Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
  - .3 If variation in colour, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.
- .5 Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - .1 Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  - .2 Manufacturer and product name, and model number if applicable.
  - .3 Number and name of room or space.
  - .4 Location within room or space.

- .6 Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section *Project Management and Coordination*.
- .7 Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section *Construction Progress Documentation*.
- .8 Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section *Payment Procedures*.
- .9 Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section *Quality Requirements*.
- .10 Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section *Closeout Procedures*.
- .11 Maintenance Data: Comply with requirements specified in Division 01 Section *Operation and Maintenance Data*.
- .12 Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of design consultants and owners, and other information specified.
- .13 Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record. Include names of firms and personnel certified.
- .14 Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- .15 Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- .16 Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- .17 Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- .18 Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- .19 Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.



- .20 Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - .1 Name of evaluation organization.
  - .2 Date of evaluation.
  - .3 Time period when report is in effect.
  - .4 Product and manufacturers' names.
  - .5 Description of product.
  - .6 Test procedures and results.
  - .7 Limitations of use.
- .21 Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- .22 Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- .23 Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- .24 Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.2 DELEGATED-DESIGN SERVICES

- .1 Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - .1 Submittals shall bear the seal and signature of the Contractor's design professional licensed in the jurisdiction of the project.
  - .2 If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Departmental Representative.

**Part 3 EXECUTION**

**3.1 CONTRACTOR'S REVIEW**

- .1 Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Departmental Representative.
- .2 Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section 01 77 00 Closeout Procedures.
- .3 Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

**3.2 DEPARTMENTAL REPRESENTATIVE'S ACTION**

- .1 Action Submittals: Departmental Representative will review each submittal, make marks to indicate corrections or revisions required, and return it. Departmental Representative will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- .2 Informational Submittals: Departmental Representative will review each submittal and will not return it, or will return it if it does not comply with requirements.
- .3 Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Departmental Representative.
- .4 Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- .5 Submittals not required by the Contract Documents may be returned by the Departmental Representative without action.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

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

**1.2 RELATED SECTIONS**

- .1 Section 01 35 30 - Health and Safety Requirements.

**1.3 REFERENCES**

- .1 Fire Protection Standards issued by Fire Protection Services, Labour Program Division of Service Canada:
  - .1 FCC No. 301-June 1982 Standard for Construction Operations.
  - .2 FCC No. 302-June 1982 Standard for Welding and Cutting.
- .2 FCC standards may be viewed at: [http://www.hrsdc.gc.ca/eng/labour/fire\\_protection/policies\\_standards/commissioner/inde.shtml](http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/inde.shtml)
  - .1 Fire Protection Services - Atlantic Region office, Halifax, N.S, Tel. 902-426-6053.

**1.4 DEFINITIONS**

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

**1.5 SUBMITTALS**

- .1 Submit copy of Hot Work Procedures and sample of Hot Work permit to Departmental Representative for review, within 14 calendar days of acceptance of bid.
- .2 Submit in accordance with section 01 33 00.

**1.6 FIRE SAFETY REQUIREMENTS**

- .1 Implement and follow fire safety measures during Work. Comply with following:
  - .1 National Fire Code 2010.
  - .2 Fire Protection Standards FCC 301 and FCC 302.
  - .3 Federal and Provincial Occupational Health and Safety Acts and Regulations.
- .2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

## 1.7 HOT WORK AUTHORIZATION

- .1 Obtain Departmental Representative's written "Authorization to Proceed" before conducting any form of Hot Work on site.
- .2 To obtain authorization submit to Departmental Representative:
  - .1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.
  - .2 Description of the type and frequency of Hot Work required.
  - .3 Sample Hot Work Permit to be used.
- .3 Upon review and confirmation that effective fire safety measures will be implemented and followed during performance of hot work, Departmental Representative will give authorization to proceed as follows:
  - .1 Issue one written "Authorization to Proceed" covering the entire project for duration of work or;
  - .2 Subdivide the work into pre-determined, individual activities, each activity requiring a separately written authorization to proceed.
- .4 Requirement for individual authorization will be based on:
  - .1 Nature or phasing of work;
  - .2 Risk to Facility operations;
  - .3 Quantity of various trades needing to perform hot work on project or;
  - .4 Other situation deemed necessary by Departmental Representative to ensure fire safety on premises.
- .5 Do not perform any Hot Work until receipt of Departmental Representative's written "Authorization to Proceed" for that portion of work.
- .6 In tenant occupied Facility, coordinate performance of Hot Work with Facility Manager through the Departmental Representative. When directed, perform Hot Work only during non-operative hours of the Facility. Follow Departmental Representative's directives in this regard.

## 1.8 HOT WORK PROCEDURES

- .1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.
- .2 Hot Work Procedures to include:
  - .1 Requirement to perform hazard assessment of site and immediate work area beforehand for each hot work event in accordance with Safety Plan specified in section 01 35 30.
  - .2 Use of a Hot Work Permit system with individually issued permit by Contractor's Superintendent to worker or subcontractor granting permission to proceed with Hot Work.
  - .3 Permit required for each Hot Work event.
  - .4 Designation of a person on site as a Fire Safety Watcher responsible to conduct a fire safety watch for a minimum duration of 60 minutes immediately following the completion of the Hot Work.

- .5 Compliance with fire safety codes, standards and occupational health and safety regulations specified.
- .6 Site specific rules and procedures in force at the site as provided by the Facility Manager.
- .3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Label document as being the Hot Work Procedures for this contract.
- .4 Procedures shall clearly establish responsibilities of:
  - .1 Worker performing hot work,
  - .2 Person issuing the Hot Work Permit,
  - .3 Fire Safety Watcher,
  - .4 Subcontractor(s) and Contractor.
- .5 Brief all workers and subcontractors on Hot Work Procedures and of Permit system. Stringently enforce compliance.

#### **1.9 HOT WORK PERMIT**

- .1 Hot Work Permit to include the following:
  - .1 Project name and project number;
  - .2 Building name and specific room or area where hot work will be performed;
  - .3 Date of issue;
  - .4 Description of hot work type needed;
  - .5 Special precautions to be followed, including type of fire extinguisher needed;
  - .6 Name and signature of permit issuer.
  - .7 Name of worker to which the permit is issued.
  - .8 Permit validity period not to exceed 8 hours. Indicate start time/date and termination time/date.
  - .9 Worker's signature with time/date of hot work completion.
  - .10 Stipulated time period of safety watch.
  - .11 Fire Safety Watcher's signature with time/date.
- .2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.
- .3 Each Hot Work Permit to be completed in full, signed and returned to Contractor's Superintendent for safe keeping on site.

#### **1.10 FIRE PROTECTION AND ALARM SYSTEMS**

- .1 Fire protection and alarm systems shall not be:
  - .1 Obstructed.
  - .2 Shut-off, unless approved by Departmental Representative.
  - .3 Left inactive at the end of a working day or shift.

- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than fire fighting.
- .3 Costs incurred, from the fire department, Facility owner and tenants, resulting from negligently setting off false alarms will be charged to the Contractor in the form of financial progress payment reductions and holdback assessments against the Contract.

**1.11 DOCUMENTS ON SITE**

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

**END OF SECTION**

**Part 1            GENERAL**

**1.1                SECTION INCLUDES**

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

**1.2                RELATED SECTIONS**

- .1        Section 01 35 30 - Health and Safety Requirements

**1.3                REFERENCES**

- .1        CSA C22.1-12, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
- .2        CAN/CSA-C22.3 No.1-06, Overhead Systems.
- .3        CSA C22.3 No.7-06, Underground Systems.
- .4        COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

**1.4                DEFINITIONS**

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

**1.5                COMPLIANCE REQUIREMENTS**

- .1        Comply with the following in regards to isolation and lockout of electrical facilities and equipment:
  - .1        Canadian Electrical Code.

- .2 Federal and Provincial Occupational Health and Safety Acts and Regulations.
- .3 Regulations and code of practise as applicable to mechanical equipment or other machinery being de-energized.
- .4 Procedures specified herein.
- .2 In event of conflict between any provisions of above authorities the most stringent provision will apply.

## **1.6 SUBMITTALS**

- .1 Submit copy of lockout procedures, sample of lockout permit and lockout tags proposed for use in accordance with Section 01 33 00. Submit within 14 calendar days of acceptance of bid.

## **1.7 ISOLATION OF EXISTING SERVICES**

- .1 Obtain Departmental Representative's written authorization prior to working on existing live or active electrical facilities and equipment and before proceeding with isolation of such item.
- .2 To obtain authorization, submit to Departmental Representative the following documentation:
  - .1 Written request to isolate the particular service or facility and;
  - .2 Copy of Contractor's Lockout Procedures.
- .3 Make a Request for Isolation for each event, unless directed otherwise by Departmental Representative, as follows:
  - .1 Fill-out standard form in current use at the Facility as provided by Departmental Representative or;
  - .2 Where no form exist, make written request indicating:
    - .1 The equipment, system or service to be isolated and it's location;
    - .2 Duration of isolation period (ie: start time & date and completion time & date).
    - .3 Voltage of service feed to system or equipment being isolated.
    - .4 Name of person making the request.
- .4 Do not proceed with isolation until receipt of written notification from Departmental Representative granting the Isolation Request and authorizing to proceed with the work.
  - .1 Note that Departmental Representative may designate another person at the Facility being authorized to grant the Isolation Request.
- .5 Conduct safe, orderly shut down of equipment or facility. De-energize, isolate and lockout power and other sources of energy feeding the equipment or facility.
- .6 Determine in advance, as much as possible, in cooperation with the Departmental Representative, the type and frequency of situations which will require isolation of existing services.
- .7 Plan and schedule shut down of existing services in consultation with the Departmental Representative and the Facility Manager. Minimize impact and downtime of Facility operations. Follow Departmental Representative's directives in this regard.



- .8 Conduct hazard assessment as part of the process in accordance with health and safety requirements specified Section 01 35 30.

## 1.8 LOCKOUTS

- .1 De-energize, isolate and lockout electrical facility, mechanical equipment and machinery from all potential sources of energy prior to working on such items.
- .2 Develop and implement clear and specific lockout procedures to be followed as part of the Work.
- .3 Prepare typed written Lockout Procedures describing safe work practices, procedures, worker responsibilities and sequence of activities to be followed on site by workforce to safely isolate an active piece of equipment or electrical facility and effectively lockout and tagout it's sources of energy.
- .4 Include as part of the Lockout Procedures a system of lockout permits managed by Contractor's Superintendent or other qualified person designated by him/her as being "in-charge" at the site.
  - .1 A lockout permit shall be issued to specific worker providing a Guarantee of Isolation before each event when work must be performed on a live equipment or electrical facility.
  - .2 Duties of person managing the permit system to include:
    - .1 Issuance of permits and lockout tags to workers.
    - .2 Determining permit duration.
    - .3 Maintaining record of permits and tags issued.
    - .4 Making a Request for Isolation to Departmental Representative when required as specified above.
    - .5 Designating a Safety Watcher, when one is required based on type of work.
    - .6 Ensuring equipment or facility has been properly isolated.
    - .7 Collecting and safekeeping lockout tags returned by workers as a record of the event.
- .5 Clearly establish, describe and allocate responsibilities of:
  - .1 Workers.
  - .2 Person managing the lockout permit system.
  - .3 Safety Watcher.
  - .4 Subcontractor(s) and General Contractor.
- .6 Generic procedures, if used, must be edited and supplemented with pertinent information to reflect specific project requirements.
  - .1 Incorporate site specific rules and procedures in force at site as provided by Facility Manager through the Departmental Representative.
  - .2 Clearly label the document as being the Lockout procedures applicable to work of this contract.
- .7 Use energy isolation lockout devices specifically designed and appropriate for type of facility or equipment being locked out.
- .8 Use industry standard lockout tags.

- .9 Provide appropriate safety grounding and guards as required.

**1.9 CONFORMANCE**

- .1 Brief all workers and subcontractors on requirements of this section. Stringently enforce use and compliance.

**1.10 DOCUMENTS ON SITE**

- .1 Post Lockout Procedures on site in common location for viewing by workers.
- .2 Keep copies of Request for Isolation forms and lockout permits and tags issued to workers on site for full duration of Work.
- .3 Upon request, make available to Departmental Representative or to authorized safety representative for inspection.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 01 35 24: Special Procedures on Fire Safety Requirements.
- .2 Section 01 35 25: Special Procedures on Lockout Requirements.

**1.2 DEFINITIONS**

- .1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- .2 Competent Person: means a person who is:
  - .1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
  - .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
  - .3 Knowledgeable about potential or actual danger to health or safety associated with the Work.
- .3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4 PPE: personal protective equipment.
- .5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

**1.3 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan prior to commencement of Work.
  - .1 Submit within 10 work days of notification of Bid Acceptance. Provide 3 copies.
  - .2 Departmental Representative will review Health and Safety Plan and provide comments.
  - .3 Revise the Plan as appropriate and resubmit within 5 work days after receipt of comments.
  - .4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall responsibility for Occupational Health and Safety of the Work.
  - .5 Submit revisions and updates made to the Plan during the course of Work.
- .3 Submit name of designated Health and Safety Site Representative and support documentation specified in the Safety Plan.
- .4 Submit building permit, compliance certificates and other permits obtained.

- .5 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other department of labour organization.
- .1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.
- .6 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .7 Submit copies of incident reports.
- .8 Submit WHMIS MSDS - Material Safety Data Sheets.

#### **1.4 COMPLIANCE REQUIREMENTS**

- .1 Comply with Occupational Health and Safety Act for Province of Newfoundland and Labrador, and Occupational Health & Safety Regulations made pursuant to the Act.
- .2 Comply with Canada Labour Code - Part II (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations as well as any other regulations made pursuant to the Act.
  - .1 The Canada Labour Code can be viewed at:  
[www.http://laws-lois.justice.gc.ca/eng/acts/L-2\\_fulltext.html](http://laws-lois.justice.gc.ca/eng/acts/L-2_fulltext.html).
  - .2 Canadian Occupational Health and Safety Regulations can be viewed at:  
<http://laws-lois.justice.gc.ca/eng/regulations/SOR-86-304/index.html>.
  - .3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A 0S9 Tel: 819-956-4800 or 1-800-635-7943 Publication No. L31-85/2000 (E or F).
- .3 Treasury Board of Canada Secretariat (TBS):
  - .1 Treasury Board, Fire Protection Standard April 1, 2010  
[www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text](http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text).
- .4 Canadian Standards Association (CSA):
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .5 Observe construction safety measures of:
  - .1 NBC 2010, Division B, Part 8.
  - .2 Municipal by-laws and ordinances.
- .6 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.
- .7 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.
- .8 Medical Surveillance: Where prescribed by legislation or regulation, obtain and maintain worker medical surveillance documentation.

#### **1.5 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons and environment adjacent to the site to extent that they may be affected by conduct of Work.

- .2 Comply with and enforce compliance by all workers, sub-contractors and other persons granted access to Work Site with safety requirements of Contract Documents, applicable federal, provincial, and local by-laws, regulations, and ordinances, and with site-specific Health and Safety Plan.

## **1.6 SITE CONTROL AND ACCESS**

- .1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.
  - .1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.
  - .2 Isolate Work Site from other areas of the premises by use of appropriate means.
    - .1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment. See Section 01 50 00 for minimum acceptable requirements.
    - .2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.
    - .3 Use professionally made signs with bilingual message in the 2 official languages or international known graphic symbols.
  - .3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.
  - .4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.
  - .5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm..

## **1.7 PROTECTION**

- .1 Give precedence to safety and health of persons and protection of environment over cost and schedule considerations for Work.
- .2 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

## **1.8 FILING OF NOTICE**

- .1 File Notice of Project with pertinent provincial health and safety authorities prior to beginning of Work.
  - .1 Departmental Representative will assist in locating address if needed.

## **1.9 PERMITS**

- .1 Post permits, licenses and compliance certificates, specified in section 01 10 10, at Work Site.

- .2 Where a particular permit or compliance certificate cannot be obtained, notify Departmental Representative in writing and obtain approval to proceed before carrying out applicable portion of work.

#### **1.10 HAZARD ASSESSMENTS**

- .1 Perform site specific health and safety hazard assessment of the Work and its site.
- .2 Carryout initial assessment prior to commencement of Work with further assessments as needed during progress of work, including when new trades and subcontractors arrive on site.
- .3 Record results and address in Health and Safety Plan.
- .4 Keep documentation on site for entire duration of the Work.

#### **1.11 PROJECT/SITE CONDITIONS**

- .1 Following are potential health, environmental and safety hazards at the site for which Work may involve contact with:
  - .1 Existing hazardous and controlled products stored on site:
    - .1 No known products.
  - .2 Existing hazardous substances or contaminated building materials:
    - .1 No known substances or contaminates.
  - .3 Known latent site and environmental conditions:
    - .1 No known site and environmental conditions
  - .4 Facility on-going operations:
    - .1 Adjacent portion of building and fields surrounding will be utilized by Tenant and public.
- .2 Above items shall not be construed as being complete and inclusive of potential health and safety hazards encountered during Work.
- .3 Include above items in the hazard assessment of the Work.
- .4 MSDS Data sheets of pertinent hazardous and controlled products stored on site can be obtained from Departmental Representative.

#### **1.12 MEETINGS**

- .1 Attend pre-construction health and safety meeting, convened and chaired by Departmental Representative, prior to commencement of Work, at time, date and location determined by Departmental Representative. Ensure attendance of:
  - .1 Superintendent of Work.
  - .2 Designated Health & Safety Site Representative.
  - .3 Subcontractors.
- .2 Conduct regularly scheduled tool box and safety meetings during the Work in conformance with Occupational Health and Safety regulations.
- .3 Keep documents on site.

**1.13 HEALTH AND SAFETY PLAN**

- .1 Prior to commencement of Work, develop written Health and Safety Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from site.
- .2 Health and Safety Plan shall include the following components:
  - .1 List of health risks and safety hazards identified by hazard assessment.
  - .2 Control measures used to mitigate risks and hazards identified.
  - .3 On-site Contingency and Emergency Response Plan as specified below.
  - .4 On-site Communication Plan as specified below.
  - .5 Name of Contractor's designated Health & Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
  - .6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.
- .3 On-site Contingency and Emergency Response Plan shall include:
  - .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
  - .2 Evacuation Plan: site and floor plan layouts showing escape routes, marshalling areas. Details on alarm notification methods, fire drills, location of fire fighting equipment and other related data.
  - .3 Name, duties and responsibilities of persons designated as Emergency Warden(s) and deputies.
  - .4 Emergency Contacts: name and telephone number of officials from:
    - .1 General Contractor and subcontractors.
    - .2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.
    - .3 Local emergency resource organizations.
  - .5 Harmonize Plan with Facility's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including name of PCA and Facility Management contacts.
- .4 On-site Communication Plan:
  - .1 Procedures for sharing of work related safety information to workers and subcontractors, including emergency and evacuation measures.
  - .2 List of critical work activities to be communicated with Facility Manager which have a risk of endangering health and safety of Facility users.
- .5 Address all activities of the Work including those of subcontractors.
- .6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade or subcontractor arrive at Work Site.
- .7 Departmental Representative will respond in writing, where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.

- .8 Post copy of the Plan, and updates, prominently on Work Site.

#### **1.14 SAFETY SUPERVISION**

- .1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.
- .2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and shall be assigned the responsibility and authority to:
- .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work
  - .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.
  - .3 Conduct site safety orientation session to persons granted access to Work Site.
  - .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
  - .5 Stop the Work as deemed necessary for reasons of health and safety.
- .3 Health & Safety Site Representative must:
- .1 Be qualified and competent person in occupational health and safety.
  - .2 Have site-related working experience specific to activities of the Work.
  - .3 Be on Work Site at all times during execution of the Work.
- .4 All supervisory personnel assigned to the Work shall also be competent persons.
- .5 Inspections:
- .1 Conduct regularly scheduled safety inspections of the Work on a minimum bi-weekly basis. Record deficiencies and remedial action taken.
  - .2 Follow-up and ensure corrective measures are taken.
- .6 Cooperate with Facility's Occupational Health and Safety representative should one be designated by Departmental Representative.
- .7 Keep inspection reports and supervision related documentation on site.

#### **1.15 TRAINING**

- .1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.
- .2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.
- .3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.



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**1.16 MINIMUM SITE SAFETY RULES**

- .1 Notwithstanding requirement to abide by federal and provincial health and safety regulations; ensure the following minimum safety rules are obeyed by persons granted access to Work Site:
  - .1 Wear appropriate PPE pertinent to the Work or assigned task; minimum being hard hat, safety footwear, safety glasses and hearing protection.
  - .2 Immediately report unsafe condition at site, near-miss accident, injury and damage.
  - .3 Maintain site and storage areas in a tidy condition free of hazards causing injury.
  - .4 Obey warning signs and safety tags.
- .2 Brief persons of disciplinary protocols to be taken for non compliance. Post rules on site.

**1.17 CORRECTION OF NON-COMPLIANCE**

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

**1.18 INCIDENT REPORTING**

- .1 Investigate and report the following incidents to Departmental Representative:
  - .1 Incidents requiring notification to Provincial Department of Occupational Safety and Health, Workers Compensation Board or to other regulatory Agency.
  - .2 Medical aid injuries.
  - .3 Property damage in excess of \$10,000.00,
  - .4 Interruptions to Facility operations resulting in an operational lost to a Federal department in excess of \$5,000.00.
- .2 Submit report in writing.

**1.19 HAZARDOUS PRODUCTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
- .2 Keep MSDS data sheets for all products delivered to site.
  - .1 Post on site.
  - .2 Submit copy to Departmental Representative.
- .3 For interior work in an occupied Facility, post additional copy in one or more publically accessible locations.

**1.20 POWDER ACTUATED DEVICES**

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

**1.21 CONFINED SPACES**

- .1 Abide by occupational health and safety regulations regarding work in confined spaces.

**1.22 SITE RECORDS**

- .1 Maintain on Work Site copy of safety related documentation and reports stipulated to be produced in compliance with Acts and Regulations of authorities having jurisdiction and of those documents specified herein.
- .2 Upon request, make available to Departmental Representative or authorized Safety Officer for inspection.

**1.23 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on Work Site in accordance with Acts and Regulations of Province having jurisdiction.
- .2 Post other documents as specified herein, including:
  - .1 Site specific Health and Safety Plan.
  - .2 WHMIS data sheets.

**END OF SECTION**

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## 1.1 RELATED SECTIONS

- .1 Waste Management and Disposal: Section 01 74 21.

## 1.2 DEFINITIONS

- .1 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .2 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.
- .3 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

## 1.3 FIRES

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

## 1.4 HAZARDOUS MATERIAL HANDLING

- .1 Store and handle hazardous materials in accordance with applicable federal and provincial laws, regulations, codes and guidelines. Store in location that will prevent spillage into the environment
- .2 Label containers to WHMIS requirements and keep MSDS data sheets on site for all hazardous materials.
- .3 Maintain inventory of hazardous materials and hazardous waste stored on site. List items by product name, quantity and date when storage began.
- .4 Store and handle flammable and combustible materials in accordance with National Fire Code.
- .5 Transport hazardous materials in accordance with federal Transportation of Dangerous Goods Regulations and applicable Provincial regulations.

## 1.5 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site. Dispose in accordance with project waste management requirements specified in section 01 74 21.
- .2 Do not dispose of hazardous waste or volatile materials, such as mineral spirits, paints, thinners, oil or fuel into waterways, storm or sanitary sewers or waste landfill sites.
- .3 Dispose of hazardous waste in accordance with applicable federal and provincial laws, regulations, codes and guidelines.
- .4 All waste materials (e.g., construction material, refuse material, waste petroleum, demolition waste) shall be removed from the site on project completion and considered, prior to disposal, for reuse, resale or recycling and then disposed at an approved facility accordingly; cover waste loads during transportation.

## 1.6 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with governing regulations and requirements.
- .4 Provide control devices such as filter fabrics, sediment traps and settling ponds to control drainage and prevent erosion of adjacent lands. Maintain in good order for duration of work.
- .5 The Contractor must prepare an erosion and sediment control plan and submit to the Departmental Representative for approval prior to the start of excavation activities.
- .6 Remove temporary erosion and sediment control products, especially non-biodegradable materials, when they are no longer required.
- .7 Regularly inspect and maintain erosion and sediment control structures during all phases of the project and modify measures as necessary.
- .8 Use erosion and sediment control products made of 100% biodegradable materials (e.g., jute, sisal or coir fiber) when possible. Ensure backing materials are also biodegradable.

## 1.7 SITE AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Departmental Representative.
- .6 Limit duration of soil exposure; phase activities whenever possible and restore disturbed areas as soon as possible.
- .7 Topsoil separation is required; stockpile topsoil away from subsoils and spoil material and more than 15 meters away from the shoreline, drainage features and/or the top of steep slopes.
- .8 Salvage topsoil for reclamation activities at this project site or others at Cape Spear.
- .9 When excavation is complete, shape loosened soils to match the local terrain and ensure noticeable construction impacts (e.g., ruts, holes, depressions, compacted areas) are appropriately re-graded, back-filled with topsoil, re-contoured and capped in preparation for restoration.
- .10 Introduction of invasive plant species must be prevented:

- .1 All soil, gravel, untreated construction lumber, erosion and sediment control products (e.g., hay, straw, mulch), or other applicable materials from outside the protected heritage place must be from a certified weed-free source.
- .2 Minimize bare soil exposure (e.g., cover stockpiled material with tarps, plant native species, cover with natural mulch/ground coverings).
- .3 Minimize ground disturbance and vegetation removal, as practical and within project requirements.
- .4 Where re-vegetation is required, stabilize and re-vegetate disturbed areas as soon as possible with native plants, soil and seed mix as directed by Parks Canada. If there is insufficient time remaining in the growing season, stabilize the site to prevent erosion to allow for re-vegetation the following spring.
- .11 Remove and maintain sod mats for replacement and improved re-vegetation success when work is complete.
- .12 Trees must be preserved and left in place. If there is no alternative and select trees/shrubs must be removed, all attempts to dig out and preserve for use in restoration efforts must be made. Any alteration to trees and shrubs must be approved by the designated Parks Canada contact.
- .13 Restore the site as close as possible to pre-construction condition focusing on re-vegetating sloped and cleared areas of the site with existing preserved sod mats, trees and shrubs and native plant/seed mix, trees and shrubs as directed by the Departmental Representative.

## **1.8 WORK ADJACENT TO WATERWAYS**

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 At borrow sites, design and construct temporary crossings to minimize erosion to waterways in strict conformance with provincial and federal environmental regulations.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or 100 m of spawning beds.
- .8 Do not refuel any type of equipment within 100 meters of a water body. Maintain equipment in good working condition with no fluid leaks, loose hoses or fittings.
- .9 Ensure all materials (e.g., organic materials, soil stockpiles, construction waste and materials) are securely stored in place, especially during high wind/storm conditions.
- .10 Concrete mixing activities must take place over tarps and a minimum of 30 meters from the shoreline and from existing drains within the tunnels. Fresh, wet, uncured concrete, concrete dust and wastewater is toxic to the aquatic environment and must not come into contact with any water body.
- .11 Prevent construction materials, chemicals and sediments from entering the existing drains within the tunnels.

## 1.9 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads and around entire construction site.
- .5 Have appropriate emergency spill response equipment and rapid clean-up kit on site located adjacent to hazardous materials storage area. Provide personal protective equipment required for clean-up.
- .6 Report, spills of petroleum and other hazardous materials as well as accidents having potential of polluting the environment to Federal and Provincial Department of the Environment.
  - .1 Notify Departmental Representative and submit a written spill report to Departmental Representative within 24 hours of occurrence.
- .7 A spill contingency response kit including sorbent material and berms to contain 110% of the largest possible spill (i.e., fuel or other toxic liquids) related to the work must be available on site at all times. On-site personnel must be aware of its location and trained in its use. Any contaminants must be recovered at source and disposed according to applicable laws, policies and regulations.

## 1.10 WILDLIFE PROTECTION

- .1 Should nests of migratory birds be encountered during work, immediately notify Departmental Representative for directives to be followed.
  - .1 Do not disturb nest site and neighbouring vegetation until nesting is completed.
  - .2 Minimize work immediately adjacent to such areas until nesting is completed.
  - .3 Protect these areas by following recommendations of Canadian Wildlife Service.
- .2 All wildlife attractants must be secured (e.g., petroleum products, human food, recyclable drink containers and garbage) within wildlife-proof containers, in a secured building or a vehicle. Keep food waste separate from construction waste and remove daily. Notify the designated Parks Canada contact, immediately should wildlife gain access to the above mentioned attractants.
- .3 Never approach or harass wildlife (e.g., feeding, baiting, luring).
- .4 Alert the designated Parks Canada contact, immediately to any potential wildlife conflict (e.g., aggressive behaviour, persistent intrusion), distress or mortality. In the case of aggressive behaviour or persistent intrusion, stop work and evacuate the area.
- .5 The Little Brown Myotis and Northern Myotis, are species of bats classified as Endangered under the Species at Risk Act and have the potential to be found at Cape Spear. Should any bat be encountered, the Contractor must:
  - .1 Immediately notify the Departmental Representative for directives to be followed.
  - .2 Stop all activities in the immediate area and do not disturb the bat(s); allow the bat to exit the area on its own.

- .3 Do not initiate activities until the bat vacates the premises. The expected time frame for a male bat to vacate the premises would be in the order of 1-3 days. In the event a maternity roost is discovered (females with pups), the expected time frame for the bats to vacate the premises would be in the order of 1-3 weeks.
- .4 The Departmental Representative will make final decision regarding shut-down times and work return times, as it relates to the discovery of bats in the tunnels. Note that there will be no additional cost to Canada for downtime associated with the discovery of endangered bats and the subsequent no-work periods established by the Departmental Representative.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 GENERAL**

- .1 Due to nature of this Facility, and client operations therein, security regulations pertaining to site will be in place during the work resulting in need for:
  - .1 Control and limit movement of construction workers at the site and inside building;
  - .2 Workers must provide valid government issued ID and sign in and sign out of site.
  - .3 Specific rules and regulations as specified in this section and as directed by the Departmental Representative to be stringently followed.
- .2 It is the Contractor's responsibility to:
  - .1 Become familiar with and abide by security rules and regulations;
  - .2 Brief all workers and subcontractors in respect of the security regulations and ensure that they abide by all rules and directives.
- .3 The Departmental Representative will coordinate a pre-construction meeting between Contractor, Facility Management and Security Personnel who will provide details and directives on control and movement on site.
- .4 Any infraction of site security regulations on the part of the Contractor, members of work force or any Subcontractor in his employ, could result in:
  - .1 Financial penalties in the form of progress payment reduction or holdback assessments being levied against the Contractor and;
  - .2 Demand immediate removal of offending party from the site.

**1.2 SECURITY CONTROL LIST**

- .1 Provide a list of employee names from workforce and from subcontractors who will be present at site during the course of work.
- .2 List to include each person's name, address and telephone number.
- .3 Submit copy of list to Departmental Representative and to Security Commissionaire for control of workers.
- .4 Update list as work progresses.
- .5 Ensure that each worker can provide government issued proof of identity upon demand, when requested by Facility's Security Personnel, Departmental Representative or by Facility Management.
  - .1 A Commissionaire provided by the Departmental Representative will be on site. All workers are to sign in and sign out of work site with Commissionaire and may be expected to provide proof of identity in the form of a valid government issued ID.



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**1.3 BUILDING ACCESS**

- .1 Keys and door security access cards necessary for access to restricted areas may be issued at the discretion of the Departmental Representative. Follow all instructions in regards to use, care and disposition of all keys and access cards so issued.
- .2 Do not, under any circumstances, make or allow workers to make duplicates of keys issued.
- .3 At end of project, return to Departmental Representative all keys and access cards issued. Departmental Representative will deduct from final contract payment, \$25.00 for each item not returned, regardless of the reason.
- .4 Immediately report to Departmental Representative any lost, stolen or destroyed keys and door security access cards.

**1.4 SITE SECURITY**

- .1 Where work of this contract requires use of a permanently locked door, it is Contractor's responsibility to ensure that door is unlocked and locked after each use or provide a competent security guard, posted at door, when door must remain open for an elongated period of time during a particular work shift.
  - .1 Notify Building Security when security doors will be used and stringently follow all directives to ensure building security is effectively maintained.
- .2 Where work of this contract results in removal of doors or walls (providing security to the exterior or between spaces and suites), erect temporary security hoarding over openings constructed in such a way to provide the same degree of security as doors/walls removed.
- .3 When work must be carried out during Off Hours or beyond the work hours previously agreed upon at start of work, provide notice within 48 hours beforehand to minimize impact on Facility's security and tenant operations.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 ABBREVIATIONS AND ACRONYMS**

- .1 The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms.

**1.2 MATERIALS, EQUIPMENT AND METHODS**

- .1 A:
- .1 AC: acoustic.
  - .2 AC PAN: acoustic panel.
  - .3 ACU: acoustic unit ceiling.
  - .4 AFF: above finished floor.
  - .5 AC PLAS: acoustic plaster.
  - .6 ACT: acoustic tile.
  - .7 ACR CU LVR: acrylic cube louvre.
  - .8 ADH: adhesive.
  - .9 ADJ: adjustable.
  - .10 A/C: air conditioner.
  - .11 AL: aluminum.
  - .12 AB: anchor bolt.
  - .13 ANOD: anodized.
  - .14 ARCH: architecture.
  - .15 ARCH BLK: architectural block.
  - .16 AVB: air vapour barrier.
- .2 B:
- .1 B: base.
  - .2 BEAST: benthic assessment of sediment.
  - .3 BH: bore hole.
  - .4 BL: bottom layer.
  - .5 BLK: block.
  - .6 BLKD: bulkhead.
  - .7 BM: beam.
  - .8 BOT: bottom.
  - .9 BMP: best management practice.
  - .10 B PL: base plate.
  - .11 BRG: bearing.
  - .12 BRK: brick.
  - .13 BSMT: basement.
  - .14 BTEX: benzene, toluene, ethylbenzene and xylenes.

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- .15 BUR: built-up roof.
- .3 C:
- .1 CAL: caliper.
- .2 CANTIL: cantilever.
- .3 CB: catch basin.
- .4 CC: centre to centre.
- .5 CCN: contemplated change notice.
- .6 CDF: controlled density fill.
- .7 CEC: Canadian Electrical Code.
- .8 CF: chair fabric.
- .9 CHAN: channel.
- .10 CHS: Canadian hydrographic service.
- .11 CJ: construction joint.
- .12 CL: centreline.
- .13 CK: cork.
- .14 CLG: ceiling.
- .15 CLR: clear.
- .16 COL: column.
- .17 CONC: concrete.
- .18 CONC BLK: concrete block.
- .19 CONC BRK: concrete brick.
- .20 CONT: continuous.
- .21 CONT J: control joint.
- .22 COMPL: complete.
- .23 CM: centimetre. (Nursery stock).
- .24 CPL: cement plaster.
- .25 CPM: critical path method.
- .26 CPT: carpet.
- .27 CPTT: carpet tile.
- .28 CT: ceramic tile.
- .29 CVT: conductive vinyl tile.
- .30 C/W: complete with.
- .4 D:
- .1 D: deep.
- .2 DD: dutch door.
- .3 DEG: degree.
- .4 DF: drinking fountain.
- .5 DIA: diameter.
- .6 DIM: dimension.
- .7 DL: dead load.

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- .8 DMNT: demountable.
  - .9 DP: dampproofing.
  - .10 DR: door.
  - .11 DRP: drapery.
  - .12 DWL: dowel.
  - .5 E:
    - .1 EA: each.
    - .2 EC: epoxy coating.
    - .3 ECF: engineered containment facility.
    - .4 EE: each end.
    - .5 EF: each face.
    - .6 EL: elevation.
    - .7 ELEC: electric.
    - .8 ELEV: elevator.
    - .9 EM: expanded metal.
    - .10 ENCL: enclosure.
    - .11 EQ: equal.
    - .12 EXH: exhaust.
    - .13 EXIST: existing.
    - .14 EXPJ: expansion joint.
    - .15 EXP STRUCT: exposed structure.
    - .16 EXT: exterior.
    - .17 EW: each way.
  - .6 F:
    - .1 FC: fuel contributed.
    - .2 FD: floor drain.
    - .3 FDN: foundation.
    - .4 FEAT W: feature wall.
    - .5 FEXT: fire extinguisher.
    - .6 FH: fire hose.
    - .7 FHC: fire hose cabinet.
    - .8 FHR: fire hose rack.
    - .9 FIN: finish.
    - .10 FIP: federal identity program.
    - .11 FL: floor.
    - .12 FLD: field.
    - .13 FLUOR: fluorescent.
    - .14 FR: frame.
    - .15 FRR: fire resistance rating.
    - .16 FTG: footing.

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- .7 G:
- .1 GALV: galvanized steel.
  - .2 GB: grab bar.
  - .3 GBD: gypsum board.
  - .4 GC: General Conditions.
  - .5 GF: ground floor.
  - .6 GFCI: ground fault circuit interrupter.
  - .7 GL: glass or glazing.
  - .8 GL BLK: glass block.
  - .9 GPC: gypsum plaster ceiling.
  - .10 GPW: gypsum plaster wall.
  - .11 GT: glass tile.
- .8 H:
- .1 HB: hose bib.
  - .2 HC: hollow core.
  - .3 HCWD: hollow core wood door.
  - .4 HD: hand dryer.
  - .5 HDW: hardware.
  - .6 HDWD: hardwood.
  - .7 HM: hollow metal.
  - .8 HOR: horizontal.
  - .9 HOR EF: horizontal each face.
  - .10 HP: hydro pole.
  - .11 HPA: Hamilton Port Authority.
  - .12 HR: hour.
  - .13 HRV: heat recovery ventilator.
  - .14 HT: height.
  - .15 HTR: heater.
  - .16 HWT: hot water tank.
  - .17 HYD: hydrant.
- .9 I:
- .1 ICF: insulated concrete formwork.
  - .2 ID: inside diameter.
  - .3 INS: insulation.
  - .4 INTLK: interlock.
- .10 J:
- .1 JT: joint.
- .11 K:
- .1 KPL: kick plate.

.12 L:

- .1 LAV: lavatory.
- .2 LDG: landing.
- .3 LG: long.
- .4 LINO: linoleum.
- .5 LL: live load.
- .6 LT: light.

.13 M:

- .1 MAS: masonry.
- .2 MAS FL: masonry flashing.
- .3 MAX: maximum.
- .4 MBG: metal bar grating.
- .5 MCL: metal cube louvre.
- .6 MECH: mechanical.
- .7 MET: metal.
- .8 MET DK: metal deck.
- .9 MET FL: metal flashing.
- .10 MET GRID CLG: metal grid ceiling.
- .11 MET GRTG: metal grating.
- .12 MET LIN CLG: metal linear ceiling.
- .13 MET T PTN: metal toilet partition.
- .14 MH: maintenance hole.
- .15 MIN: minimum.
- .16 MLP: metal lath and plaster.
- .17 MO: masonry opening.
- .18 MR: marble.
- .19 MT: metal threshold.
- .20 MWP: membrane waterproofing.

.14 N:

- .1 NBC: national building code.
- .2 NF: near face.
- .3 NFC: national fire code.
- .4 NIC: not in contract.
- .5 NO: number.
- .6 NRC: noise reduction coefficient.
- .7 NRP: non removable pin.
- .8 NTS: not to scale.

.15 O:

- .1 OBC: Ontario building code.
- .2 OC: on centre.

- .3 OD: outside diameter.
- .4 OPNG: opening.
- .5 OPR: operator.
- .6 OVHD: overhead.
- .7 OWSJ: open web steel joist.
- .16 P:
  - .1 P: prefinished.
  - .2 PAH: polynuclear aromatic hydrocarbons.
  - .3 PARG: parging.
  - .4 PCC: precast concrete.
  - .5 PCT: porcelain ceramic tile.
  - .6 PED ACS FLG: pedestal access flooring.
  - .7 PF: panel fabric.
  - .8 PL: plate.
  - .9 PLAM: plastic laminate.
  - .10 PLAS: plaster.
  - .11 PLYWD: plywood.
  - .12 PR: pair.
  - .13 PREFAB: prefabricated.
  - .14 PREFIN: prefinished.
  - .15 PRFL: profile.
  - .16 PT: paint.
  - .17 PTD: paper towel dispenser.
  - .18 PTN: partition.
  - .19 PVC: polyvinyl chloride.
- .17 Q:
  - .1 QTB: quarry tile base.
  - .2 QTF: quarry tile floor.
  - .3 QTR: quarry tile roof.
- .18 R:
  - .1 R: radius.
  - .2 RA: return air.
  - .3 RB: resilient base.
  - .4 RC: reinforced concrete.
  - .5 RCPT: receptacle.
  - .6 RD: roof drain.
  - .7 REINF: reinforced/reinforcing.
  - .8 REQD: required.
  - .9 REQT: requirement.
  - .10 RFT: rubber floor tile.

- .11 RM: room.
- .12 RO: rough opening.
- .13 RP: radiant panel.
- .14 RRS: recycled rubber sheet.
- .15 RRT: recycled rubber tile.
- .16 RSD: rolling steel door.
- .17 RSF: rubber sheet flooring.
- .18 RTU: roof top unit.
- .19 RWL: rain water leader.
- .19 S:
  - .1 SAN SEW: sanitary sewer.
  - .2 SCHED: schedule.
  - .3 SC: solid core.
  - .4 SCR N: screen.
  - .5 SCWD: solid core wood door.
  - .6 SD: smoke developed.
  - .7 SDT: static dissipative tile.
  - .8 SECT: section.
  - .9 SH: sill height.
  - .10 SIM: similar.
  - .11 SL: sliding.
  - .12 SLR: sealer.
  - .13 SPEC: specification.
  - .14 SS: stainless steel.
  - .15 STD: standard.
  - .16 STL: steel.
  - .17 STL BM: steel beam.
  - .18 STC: sound transmission class.
  - .19 STL FL DK: steel floor deck.
  - .20 STL PL: steel plate.
  - .21 STN: stone.
  - .22 STR: structure or structural.
  - .23 ST SEW: storm sewer.
  - .24 S&U: stain and urethane.
  - .25 S&V: stain and varnish.
  - .26 SVT: solid vinyl tile.
- .20 T:
  - .1 T: top.
  - .2 T&B: top and bottom.
  - .3 TCB: turbidity control plan.



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- .4 TEL: telephone.
  - .5 TER: terrazzo.
  - .6 TERT: terrazzo tile.
  - .7 THKNS: thickness.
  - .8 THR: threshold.
  - .9 TMPD: tempered.
  - .10 TOPG: topping.
  - .11 TRANSV: transverse.
  - .12 TYP: typical.
  
  - .21 U:
    - .1 U: urethane.
    - .2 UCUT: undercut.
    - .3 UGRD: underground.
    - .4 UNO: unless noted otherwise.
    - .5 UOS: unless otherwise specified.
    - .6 U/S: underside.
    - .7 UR: urinal.
  
  - .22 V:
    - .1 VCF: vinyl coated fabric.
    - .2 VCT: vinyl composite tile.
    - .3 VERT: vertical.
    - .4 VERT B: vertical blinds.
    - .5 VERT EF: vertical each face.
    - .6 VSF: vinyl sheet flooring.
    - .7 VT: vinyl tile.
    - .8 VWC: vinyl wall covering.
  
  - .23 W:
    - .1 WC: water closet.
    - .2 W-C: wall connectors.
    - .3 WD: wood.
    - .4 WDV: wood veneer.
    - .5 WH: wall hydrant.
    - .6 WHMIS: workplace hazardous materials information system.
    - .7 WP: waterproofing.
    - .8 WR: washroom.
    - .9 WSIB: workplace safety and insurance board.
    - .10 WT: weight.
    - .11 WTP: water treatment plant.

### 1.3 STANDARDS ORGANIZATIONS

- .1 Standards writing organizations:
  - .1 AA - Aluminum Association.
  - .2 ACPA - American Concrete Pipe Association.
  - .3 ANSI - American National Standards Institute.
  - .4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.
  - .5 ASTM - American Society for Testing and Materials.
  - .6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.
  - .7 AWWA - American Water Works Association.
  - .8 AWWA - American Water Works Association.
  - .9 BHMA - Builders Hardware Manufacturers Association.
  - .10 CCDC - Canadian Construction Documents Committee.
  - .11 CCMPPA - Canadian Concrete Masonry Producers Association.
  - .12 CGSB - Canadian General Standards Board.
  - .13 CNTA - Canadian Nursery Trades Association.
  - .14 CPCA - Canadian Painting Contractors Association.
  - .15 CRCA - Canadian Roofing Contractors Association.
  - .16 CSA - Canadian Standards Association.
  - .17 CSC - Construction Specifications Canada.
  - .18 CSDMA - Canadian Steel Door Manufacturers Association.
  - .19 CSI - Construction Specifications Institute.
  - .20 CSSBI - Canadian Sheet Steel Building Institute.
  - .21 CRCA - Canadian Roofing Contractors Association.
  - .22 DHI - Door and Hardware Insitute.
  - .23 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.
  - .24 ESA - Electrical Safety Authority.
  - .25 FCC - Fire Commissioner of Canada.
  - .26 FSC - Forest Stewardship Council.
  - .27 GANA - Glass Association of North America.
  - .28 HMMA - Hollow Metal Manufacturers Association.
  - .29 IEEE - Institute of Electrical and Electronics Engineers Inc.
  - .30 ISO - International Organization for Standardization.
  - .31 IWFA - International Window Film Association.
  - .32 MPI - Master Painters Institute.
  - .33 NAAMM - National Association of Architectural Metal Manufacturers.
  - .34 NCPI - National Clay Pipe Institute.
  - .35 NEMA - National Electrical Manufacturers Association.
  - .36 NFPA - National Fire Protection Association.
  - .37 PPI - Plastics Pipe Institute.

- .38 SDI - Steel Door Intitute.
- .39 SCAQMD - South Coast Air Quality Management District.
- .40 TIA - Telecommunications Industry Association.
- .41 TIAC - Thermal Insulation Association of Canada.
- .42 TTMAC - Terrazzo Tile and Marble Association of Canada.
- .43 UL - Underwriters Laboratories.
- .44 ULC - Underwriters Laboratories of Canada.
- .45 US EPA - United States Environmental Protection Agency.
- .46 WH - Warnock Hersey.

#### **1.4 FEDERAL GOVERNMENT DEPART- MENTS AND AGENGIES**

- .1 Departments, agencies and crown corporations.
  - .1 CEAA - Canadian Environmental Assessment Agency.
  - .2 CSC - Correctional Service Canada.
  - .3 CRA - Canada Revenue Agency.
  - .4 DND - Department of National Defence.
  - .5 EC - Environment Canada.
  - .6 FHBRO - Federal Heritage Buildings Review Office.
  - .7 HC - Health Canada.
  - .8 HCD - Heritage Conservation Directorate.
  - .9 LC - Labour Canada.
  - .10 PC - Parks Canada.
  - .11 PWGSC - Public Works and Government Services Canada.
  - .12 RCMP - Royal Canadian Mounted Police.
  - .13 TBS - Treasury Board Secretariat.
  - .14 TC - Transport Canada.

#### **1.5 UNITS OF MEASURE METRIC**

- .1 The following abbreviations of units of measure are commonly found in the Project Manual:
  - .1 C: Celsius.
  - .2 cm: centimetre.
  - .3 kg: kilogram.
  - .4 kg/mü: kilogram per cubic metre.
  - .5 kN: kilonewton.
  - .6 kPa: kilopascals.
  - .7 kw: kilowatts.
  - .8 l/s: litre per second.
  - .9 m: metre.
  - .10 mü: cubic metre.
  - .11 mg/kg: milligrams per kilogram.

- .12 mg/L: milligrams per litre.
- .13 mm: millimetres.
- .14 MPa: megapascal.
- .15 NTU: nephelometric turbidity unit.
- .16 ppm: parts per million.
- .17 ug/L: micrograms per litre.
- .18 ug/m<sup>3</sup>: micrograms per cubic metre.

## 1.6 UNITS OF MEASURE IMPERIAL

- .1 The following abbreviations of units of measure are commonly found in the Project Manual:
  - .1 F: Fahrenheit.
  - .2 ft: foot/feet.
  - .3 ga: guage.
  - .4 gpm: gallons per minute.
  - .5 in: inches.
  - .6 lbs: pounds.
  - .7 NTU: nephelometric turbidity unit.
  - .8 psi: pounds-force per square inch.
  - .9 ppm: parts per million.

## PART 2 PRODUCTS

### 2.1 NOT USED

- .1 Not Used.

## PART 3 EXECUTION

### 3.1 NOT USED

- .1 Not Used.

END OF SECTION

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**Part 1 GENERAL**

**1.1 INSPECTION**

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

**1.2 TESTING**

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

**1.3 REJECTED WORK**

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

**1.4 MOCK-UPS**

- .1 Prepare mock-ups of certain work as specified in various sections of the Specifications. Include in each mock-up all related work components representative of final assembly.

- .2 Construct in locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing a schedule fixing dates for preparation.
- .6 Dismantle and remove mock-up when directed by Departmental Representative, unless approval is given for mock-up to remain as part of the Work.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SITE ACCESS AND PARKING**

- .1 The Departmental Representative will designate Contractor's access to project site, as well as parking facilities for equipment. Contractor's personnel will have to find alternative off-site parking throughout the entire construction period.
- .2 Vehicular traffic and staging areas will be restricted to present-day roadways and disturbed areas.
- .3 Maintain existing roads and parking areas at site, where used by Contractor, for duration of contract.
  - .1 Keep clean and free of mud and dirt by washing on a regular basis.
  - .2 Provide snow removal in areas located within construction site or enclosed by work.
  - .3 Make good and repair damage resulting from Contractor's use of existing roads, asphalted areas and lawns on site.

**1.2 BUILDING ACCESS**

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

**1.3 CONTRACTOR'S SITE OFFICE**

- .1 Be responsible for and provide own site office, if required, including electricity, heat, lights and telephone. Locate site office as directed by Departmental Representative.

**1.4 MATERIAL STORAGE**

- .1 Area for site storage trailers will be made available to the left of the building (when facing the building from parking lot).

**1.5 SITE ENCLOSURES**

- .1 Provide temporary fence to enclose various construction areas of work site.
- .2 Erect wood fence to 2400 mm height, constructed as follows:
  - .1 Use 38 x 89 mm construction grade framing spaced at maximum 600 mm oc covered with 13 mm thick exterior grade fir plywood on public side and adequately braced.
  - .2 Apply plywood panels vertically with flush and butted joints.
  - .3 Provide one truck gate and at least one pedestrian door as directed by Departmental Representative.
  - .4 Paint public side of site enclosure in selected colours with one coat primer to CGSB 1-GP-55e and one coat exterior paint to CGSB 1-GP-59M.
  - .5 Maintain public side of enclosure in clean condition.
- .3 Make all gates lockable and provide keyed padlocks.

- .4 Obtain Departmental Representative's approval beforehand of location and layout of all temporary fence enclosures.
- .5 Provide battery powered lanterns around the perimeter of the site enclosure to clearly mark its location at night.
- .6 Provide warning signs affixed to all fenced areas, identifying those enclosed areas as "Construction Zones" with access restricted to only those persons so authorized by General Contractor.
- .7 Do not construe fencing as an acceptable replacement for pedestrian walkway and hoarding requirements specified below.

#### **1.6 PEDESTRIAN WALKWAYS AND HOARDING**

- .1 Ensure maximum safety and security to facility users during the course of work.
- .2 Maintain access and egress to building entrances and fire exits designated by Departmental Representative to remain in use.

#### **1.7 INTERIOR HOARDING**

- .1 Erect hoarding inside building to isolate construction areas and protect occupants for duration of work.
- .2 Construct hoarding as follows:
  - .1 Height: to underside of floor or roof above.
  - .2 Framing type: wood studs spaced at 600 oc
  - .3 Covering: 12 mm thick plywood sheathing, finished and painted as follows: to match adjacent.
  - .4 Sealed to abutting surfaces and insulated.
  - .5 Access Doors: 1 wood pedestrian door soundsealed, dust tight and lockable.

#### **1.8 INTERIOR DUST CONTROL AND DUST BARRIERS**

- .1 Control creation and spread of dust and dirt to building interior and in particular to areas within premises still under use by occupants.
- .2 Develop and implement a dust control plan, addressing effective measures to carry out work with least amount of dust being created and propagated.
  - .1 Carefully evaluate the type of work to be undertaken and the physical layout of each work area on site.
  - .2 Provide specifically tailored strategy for each work area.
  - .3 Pre-determine location and placement of dust barriers to confine resulting dust to immediate work area.
  - .4 Inform Departmental Representative of the proposed dust control measures to be followed at each work area and for each major dust generating activities. Obtain Departmental Representative's approval before proceeding with work.
- .3 Dust control plan to incorporate as a minimum the following dust protection and cleaning requirements:
  - .1 Erect dustproof partitions completely around work area to fully isolate construction from other parts of the building.



- .2 Construct dust partitions as follows:
  - .1 Use 10 mm polyethylene installed and sealed tightly to abutting walls, ceilings and floor with continuous duct tape along all edges and seams. Support in position with 38 x 89 wood framing at 400 mm o.c. Locate seams only at framing members and overlap sheeting by minimum of 150 mm.
  - .3 Provide additional dust barriers, placed tightly to underside of the floor/roof deck above, in locations where existing walls are used as part of the dust barrier system but simply terminate at the finished ceiling level resulting in an open space above, or other similar condition, permitting dust to migrate beyond the construction areas.
  - .4 Make all dust barriers airtight, effectively blocking and stopping all dust migration.
  - .5 Inspect dust barriers at various intervals during each work shift. Immediately fix tears, unsealed edges and maintain barriers effectively sealed for the entire work duration.
  - .6 Shut down existing ventilation system feeding construction space, or disconnect and seal-off supply and return air ducts to stop dust from contaminating other areas.
  - .7 Immediately clean areas in use by occupants and public contaminated by work.
  - .8 Vacuum carpets, wash floors and walls. Remove accumulated dust from all surfaces. Clean and remove smears, scuffs and marks.
- .4 Meager attempts at controlling dust will not be tolerated. Failure to provide effective dust control during work and to perform satisfactory cleaning thereafter will result in Departmental Representative to proceed and obtain a separate cleaning service agency to perform cleaning to tenant's satisfaction with cost for such services being charged against this Contract in the form of financial holdbacks.
- .5 Obtain Departmental Representative's approval before erecting any dust partitions simply to underside of finish ceiling.
- .6 Construction of dust barriers, enclosures and placement of temporary protective devices to be performed during Facility non-operational off-hour periods.

## **1.9 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 Sanitary facilities are available at the site and may be used by Contractor's work force. Make arrangements for the use of such facilities through the Departmental Representative.
- .4 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Departmental Representative.

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**1.10 ENCLOSURE OF STRUCTURE**

- .1 Provide temporary weathertight enclosures and protection for exterior openings until permanently enclosed.
- .2 Provide weathertight and heated enclosures to conduct exterior work during winter and other inclement weather conditions. Erect to allow accessibility for installation of materials and working inside of enclosure.
- .3 Design enclosures to withstand wind pressure and snow loading.

**1.11 POWER**

- .1 Power supply is available on site, however the contractor is to provide its own power for construction.
- .2 Provide and pay all costs to supply and install temporary cabling, panelboards, switching devices and other equipment as required to connect into power source, provide adequate ground fault protection and extend power supply from existing source to work areas. Perform work and make all connections in accordance with the CSA C22.1-12 Canadian Electrical Code, in compliance with the federal and provincial Occupational Health and Safety Regulations as specified in section 01 35 30 and to lockout requirements specified in section 01 35 25.
- .3 Provide and maintain temporary lighting to conduct work. Ensure illumination level is not less than 162 lx in all locations.
- .4 Electrical power and lighting systems installed under this Contract can be used for construction requirements provided that guarantees are not affected thereby. Make good damage. Replace lamps which have been used over period of 3 months.

**1.12 WATER SUPPLY**

- .1 Water is not available on site during the construction season. Water is trucked in for domestic use only during the visitor season.

**1.13 SCAFFOLDING**

- .1 Design, construct and maintain scaffolding in rigid, secure and safe manner in accordance with CSA Z797-09, Code of Practice for Access Scaffold.
- .2 Erect scaffolding independent of walls. Remove when no longer required.

**1.14 HEATING AND VENTILATING**

- .1 Supply, install and pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be permitted.
- .2 Provide temporary heat and ventilation in enclosed areas as required to:
  - .1 Facilitate progress of work.
  - .2 Protect work and products against dampness and cold.
  - .3 Prevent moisture condensation on surfaces.
  - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

- .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .3 Maintain minimum temperature of 10 degrees C, or higher where specified, as soon as finishing work is commenced and maintain until acceptance of structure by Departmental Representative.
  - .1 Maintain ambient temperature and humidity levels as required for comfort of office personnel.
- .4 Ventilating:
  - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
  - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
  - .4 Ventilate storage spaces containing hazardous or volatile materials.
  - .5 Ventilate temporary sanitary facilities.
  - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform with applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .6 Submit bid assuming existing or new equipment and systems will not be used for temporary heating and ventilating.
- .7 Upon acceptance of bid, Departmental Representative may permit use of permanent system providing agreement can be reached on:
  - .1 Conditions of use, special equipment, protection and maintenance.
  - .2 Saving on Contract price.
  - .3 Provisions relating to warranties on equipment.

## 1.15 CONSTRUCTION SIGN AND NOTICES

- .1 Upon request by Departmental Representative, erect a self supporting project sign in location indicated.
- .2 Departmental Representative will provide a vinyl sign facing for installation by Contractor on sign framework. Sign frame to be plywood face of approximately 1200 x 2400 mm in size complete with required wood framing at 400 mm o.c and support posts.
- .3 Install sign plumb and level in neat wood framework and securely anchor in ground by posts to withstand wind pressure of 160 km/h.
- .4 Contractor or subcontractor advertisement signboards are not permitted on site.

.5 Safety and Instruction Signs and Notices:

- .1 Signs and notices for safety and instruction shall be in both official languages or commonly understood graphic symbols conforming to CAN/CSA-Z321-96(R2006).

.6 Maintenance and Disposal of Site Signs:

- .1 Maintain approved signs and notices in good condition for duration of project and dispose of off site on completion of project or earlier if directed by Departmental Representative.

**1.16 REMOVAL OF TEMPORARY FACILITIES**

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

**END OF SECTION**

## **1.1 GENERAL**

- .1 Use new material and equipment unless otherwise specified.
- .2 Within 7 days of written request by Departmental Representative, submit following information for any 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 Compliance to specified standards.
  - .5 Manufacturer's installation or application instructions.
  - .6 Evidence of arrangements to procure.
  - .7 Evidence of manufacturer delivery problems or unforeseen delays.
- .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
- .4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

## **1.2 PRODUCT QUALITY**

- .1 Contractor shall be solely responsible for submitting relevant technical data and independent test reports to confirm whether a product or system proposed for use meets contract requirements and specified standards.
- .2 Final decision as to whether a product or system meets contract requirements rest solely with the Departmental Representative in accordance with the General Conditions of the Contract.

## **1.3 ACCEPTABLE MATERIALS AND ALTERNATIVES**

- .1 Acceptable Materials: When materials specified include trade names or trade marks or manufacturer's or supplier's name as part of the material description, select and only use one of the names listed for incorporation into the Work.
- .2 Alternative Materials: Submission of alternative materials to trade names or manufacturer's names specified must be done during the bidding period following procedures indicated in the Instructions to Bidders.
- .3 Substitutions: After contract award, substitution of a specified material will be dealt with as a change to the Work in accordance with the General Conditions of the Contract.

## **1.4 MANUFACTURERS INSTRUCTIONS**

- .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods to be used. Do not rely on labels or enclosure provided with products. Obtain written instructions directly from manufacturers.

- .2 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer's instructions, so that Departmental Representative will designate which document is to be followed.

## **1.5 AVAILABILITY**

- .1 Immediately notify Departmental Representative in writing of unforeseen or unanticipated material delivery problems by manufacturer. Provide support documentation as per clause 1.1.2 above.

## **1.6 WORKMANSHIP**

- .1 Ensure quality of work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.
- .2 Remove unsuitable or incompetent workers from site as stipulated in the General Conditions of the Contract.
- .3 Ensure cooperation of workers in laying out work. Maintain efficient and continuous supervision on site at all times.
- .4 Coordinate work between trades and subcontractors. See section 01 14 10 in this regard.
- .5 Coordinate placement of openings, sleeves and accessories.

## **1.7 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 and in humid areas.
- .2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood or organic material plugs not acceptable.
- .3 Keep exposed fastenings to minimum, space evenly and lay out neatly.
- .4 Fastenings which cause spalling or cracking of material to which anchorage is made, are not acceptable.
- .5 Do not use explosive actuated fastening devices unless approved by Departmental Representative. See section on Health and Safety Requirements in this regard.

## **1.8 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur and, use resilient washers with stainless steel.

## **1.9 STORAGE, HANDLING AND PROTECTION**

- .1 Deliver, handle and store materials in manner to prevent deterioration and soiling and in accordance with manufacturer's instructions when applicable.

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

**END OF SECTION**

**Part 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
  - .1 Structural integrity of elements of project.
  - .2 Integrity of weather-exposed or moisture-resistant elements.
  - .3 Efficiency, maintenance, or safety of operational elements.
  - .4 Visual qualities of sight-exposed elements.
  - .5 Work of Owner or separate contractor.
- .3 Include in request:
  - .1 Identification of project.
  - .2 Location and description of affected Work.
  - .3 Statement on necessity for cutting or alteration.
  - .4 Description of proposed Work, and products to be used.
  - .5 Alternatives to cutting and patching.
  - .6 Effect on Work of Owner or separate contractor.
  - .7 Written permission of affected separate contractor.
  - .8 Date and time work will be executed.

**1.2 MATERIALS**

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

**1.3 PREPARATION**

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

**1.4 EXECUTION**

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.



- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 This Section includes procedural requirements for cutting and patching.
- .2 Related Sections include the following:
  - .1 Section 02 41 13 - Selective Structure Demolition.
  - .2 Divisions 2 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

**1.2 DEFINITIONS**

- .1 Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- .2 Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

**1.3 QUALITY ASSURANCE**

- .1 Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- .2 Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety. Operating elements include the following:
  - .1 Primary operational systems and equipment.
  - .2 Air or smoke barriers.
  - .3 Fire-suppression systems.
  - .4 Mechanical systems piping and ducts.
  - .5 Control systems.
  - .6 Communication systems.
  - .7 Conveying systems.
  - .8 Electrical wiring systems.
- .3 Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
  - .1 Water, moisture, or vapour barriers.
  - .2 Membranes and flashings.
  - .3 Exterior curtain-wall construction.
  - .4 Equipment supports.

- .5 Piping, ductwork, vessels, and equipment.
- .6 Noise- and vibration-control elements and systems.
- 4 Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Departmental Representative's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- .5 Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

#### **1.4 WARRANTY**

- .1 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 General: Comply with requirements specified in other Sections.
- .2 In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - .1 If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

### **Part 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - .1 Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - .2 Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- .1 Temporary Support: Provide temporary support of Work to be cut.

- .2 Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- .3 Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- .4 Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

### 3.3 PERFORMANCE

- .1 General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - .1 Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- .2 Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - .1 In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - .2 Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - .3 Concrete and masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - .4 Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
  - .5 Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - .6 Proceed with patching after construction operations requiring cutting are complete.
- .3 Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - .1 Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

- .2 Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - .1 Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - .2 Restore damaged pipe covering to its original condition.
  - .3 Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - .1 Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  - .4 Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  - .5 Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.
- .4 Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

**END OF SECTION**

## **1.1 GENERAL**

- .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

## **1.2 MATERIALS**

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

## **1.3 CLEANING DURING CONSTRUCTION**

- .1 Maintain work site in a tidy condition, free from accumulations of waste material and debris. Clean areas on a daily basis.
- .2 Keep building entrances, corridors, stairwells and tenant occupied areas of building in a clean dust free condition at all times. Conduct thorough cleaning of these areas when used by workers or affected by the Work.
- .3 Provide on-site dump type and recycling containers for collection of waste materials and debris.
- .4 Use separate collection bins, clearly marked as to purpose, for source separation and recycling of waste and debris in accordance with waste management requirements specified.
- .5 Work Site is in a location that experience high wind speeds that have the potential to blow unsecured waste material and debris around. Ensure waste material is secured by cover and removed from site on a minimum weekly basis. More frequent removal may be required at the discretion of the Departmental Representative.
- .6 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .7 Provide dust barriers, dividers, seals on doors and employ other dust control measures as required to ensure that dust and dirt, generated by work, are not transmitted to existing areas of building. Should dust migrate into tenant occupied and public areas of building, employ such means as may be necessary to immediately clean all contaminated surfaces to the satisfaction of the Departmental Representative.
  - .1 See Section 01 50 00 for requirements on dust control and for erection of dust partitions.
- .8 Immediately clean all dust, dirt, smears, scuffs and soiled surfaces in lobbies, corridors, stairwells and within tenant occupied areas resulting from the Work.
  - .1 Perform cleaning, dusting and washing operations, carpet vacuuming (including shampooing if deemed required by Departmental Representative) and floor washing as necessary to thoroughly clean all soiled surfaces.
- .9 Remove snow and ice from access doors used by workforce.

**1.4 FINAL CLEANING**

- .1 In preparation for acceptance of the completed work perform final cleaning.
- .2 Remove grease, dust, dirt, stains, labels, fingerprints, marks and other foreign materials, from interior and exterior finished surfaces. Clean and polish surfaces including glass, mirrors, hardware, wall tile, stainless steel, chrome, baked enamel, plastic laminate, mechanical and electrical fixtures.
- .3 Replace items with broken pieces, scratches or disfigured.
- .4 Clean lighting reflectors, lenses, and other lighting surfaces.
- .5 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .6 Wax, seal, shampoo or prepare floor finishes as recommended by manufacturer.
- .7 Inspect finishes, fitments and equipment. Ensure specified workmanship and operation.
- .8 Broom clean and wash exterior paved surfaces and walks; rake clean other surfaces of grounds.
- .9 Remove debris and surplus materials from crawl areas, roof areas and other accessible concealed spaces.
- .10 Clean equipment, washroom and kitchen fixtures to a sanitary condition. Replace filters of mechanical equipment.

**END OF SECTION**

## 1.1 DEFINITIONS

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

## 1.2 WASTE MANAGEMENT

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

## 1.3 DISPOSAL REQUIREMENTS

- .1 Burying or burning of rubbish and waste materials is prohibited.
- .2 Disposal of volatile materials, mineral spirits, oil, paint, and other hazardous materials into waterways, storm, or sanitary sewers is prohibited.
- .3 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.



- .4 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with provincial and municipal regulations.
- .5 Transport and dispose of waste intended for waste processing plant or landfill facility in separated condition and to Operator's rules and recommendations in support of their effort to recycle, reduce and divert certain waste stream from general landfill.
- .6 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.
- .7 Sale of salvaged items by Contractor to other parties not permitted on site.

**END OF SECTION**

**1.1 SECTION INCLUDES**

- .1 Administrative procedures preceding inspection and acceptance of Work by Departmental Representative.

**1.2 RELATED SECTIONS**

- .1 Section 01 78 00: Closeout Submittals.

**1.3 INSPECTION AND DECLARATION**

- .1 Contractor's Inspection: Coordinate and perform, in concert with subcontractors, an inspection and check of all Work. Identify and correct deficiencies, defects, repairs and perform outstanding items as required to complete work in conformance with Contract Documents.
  - .1 Notify Departmental Representative in writing when deficiencies from Contractor's inspection have been rectified and that Work is deemed to be complete and ready for Departmental Representative's inspection of the completed work.
  - .2 Departmental Representative's Inspection: Accompany Departmental Representative during all substantial and final inspections of the Work.
    - .1 Address defects, faults and outstanding items of work identified by such inspections.
    - .2 Advise Departmental Representative when all deficiencies identified have been rectified.
  - .3 Note that Departmental Representative will not issue a Certificate of Substantial Performance of the work until such time that Contractor performs following work and turns over the specified documents:
    - .1 Project record as-built documents;
    - .2 Final Operations and Maintenance manuals;
    - .3 Maintenance materials, parts and tools;
    - .4 Compliance certificates from applicable authorities;
    - .5 Reports resulting from designated tests;
    - .6 Demonstration and training complete with user manuals;
    - .7 Manufacturer's Guarantee certificates.
    - .8 Testing, adjusting and balancing of equipment and systems complete with submission of test reports.
    - .9 Commissioning of equipment and systems specified.
  - .4 Correct all discrepancies before Departmental Representative will issue the Certificate of Completion.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Project Record Documents.
- .2 Operations and Maintenance data.

**1.2 RELATED SECTIONS**

- .1 Section 01 79 00: Demonstration and Training.

**1.3 PROJECT RECORD DOCUMENTS**

- .1 Departmental Representative will provide 2 white print sets of contract drawings and 2 copies of Specifications Manual specifically for "As-Built" purposes.
- .2 Maintain at site one set of the contract drawings and specifications to record actual As-Built site conditions.
- .3 Maintain up-to-date, real time as-built drawings and specifications in good condition and make available for inspection by the Departmental Representative upon request.
- .4 As-Built Drawings:
  - .1 Record changes in red ink on the prints. Mark only on one set of prints and at completion of work, neatly transfer notations to second set (also by use of red ink).
  - .2 Submit both sets to Departmental Representative prior to application for Certificate of Substantial Performance.
  - .3 Stamp all drawings with "As-Built". Label and place Contractor's signature and date.
  - .4 Show all modifications, substitutions and deviations from what is shown on the contract drawings.
  - .5 Record following information:
    - .1 Depths of various elements of foundation in relation to first floor level.
    - .2 Horizontal and vertical location of exterior underground utilities and appurtenances referenced to permanent surface improvements.
    - .3 Horizontal and vertical location of various elements in relation to Geodetic Datum;
    - .4 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure;
    - .5 Field changes of dimension and detail;
    - .6 Location of all capped or terminated services and utilities.
    - .7 Chases for mechanical, electrical and other services;
    - .8 Ceiling and floor elevations;
    - .9 Reflected ceiling plan condition showing finished layout of all ceiling-mounted services and devices;
    - .10 Plumbing, heating, air conditioning and ventilation, sprinkler and electrical service installation locations; all to be dimensioned and referenced to building columns or load bearing walls;

- .11 All structural steel installations to be fully dimensioned;
  - .12 All design elevations, sections, floor plans and details dimensioned and marked-up to consistently report finished installation conditions;
  - .13 Any details produced in the course of the contract by the Departmental Representative to supplement or to change existing design drawings;
  - .14 All change orders issued over the course of the contract must be documented on the finished As-Built documents, accurately and consistently depicting the changed condition as it applies to all affected drawing details.
- .5 As-Built Specifications: legibly mark in red each item to record actual construction, including:
- .1 Changes made by Addenda and Change Orders.
  - .2 Mark up both copies of specifications; stamp "As-Built", sign and date similarly to drawings as per above clause.
- .6 Maintain As-Built documents current as the contract progresses. Departmental Representative will conduct reviews and inspections of the documents on a regular basis. Failure to maintain as-builts current and complete to satisfaction of the Departmental Representative shall be subject to financial penalties in the form of progress payment reductions and holdback assessments.
- .7 Submit on paper and in electronic format as pdf files. Forward pdf and in the native program format, MS Word, Autocad dwg and photograph jpg files on USB compatible with PCA encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

#### **1.4 REVIEWED SHOP DRAWINGS**

- .1 Provide a complete set of all shop drawings reviewed for project to incorporate into each copy of the Operations and Maintenance Manuals.
- .2 Submit full sets at same time and as part of the contents of the Operation and Maintenance Manuals specified.

#### **1.5 UPDATING OF DIGITAL DRAWINGS**

- .1 Obtain and pay for the services of a qualified drafting firm to update the digital files which were used to produce the contract drawings.
  - .1 Update the digital drawing files with the same As-Built information as specified for the paper As-Built drawings.
  - .2 Supply of digital documents does not replace the requirement to provide marked-up white prints specified above.
- .2 The Departmental Representative will provide a copy of the digital drawing files.
- .3 Incorporate the as-built changes to the digital drawings by following the standards specified in the latest version of the PCA National CADD Standard. A copy of this manual will be provided by the Departmental Representative.
- .4 Make revisions to electronic files found to be in non-conformance with the PCA National CADD Standard as directed by Departmental Representative.
- .5 In regards to updating the digital files to reflect changes resulting from Change Orders, the change in cost of completing the As-Built documentation of changes is to be included

in the amount for each Change Order issued. The amount included will constitute only the increase or decrease in CADD related costs resulting directly from the change. In determining the cost difference, full consideration will be given to the fact that other clauses of this section require As-Built CADD updates to the drawings irrespective of any Change Orders.

- .6 Deliver the digital As-Built information in same format and sequence as the contract drawings and specifications.
  - .1 Submit on PCA encrypted USB.
  - .2 Provide 1 full set of paper plots.
  - .3 Submit the digital As-Built at the same time as the marked-up paper white prints.

## 1.6 OPERATIONS & MAINTENANCE MANUAL

- .1 O&M Manual - Definition: an organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of the specifications.
- .2 Manual Language: final manuals to be in English language.
  - .1 Upon review and acceptance by Departmental Representative, submit 3 final copies. Interim copies are not to be considered as part of the final copies unless they have been fully revised and are identical to the final approved version.
- .3 Submission Date: submit complete operation and maintenance manual to Departmental Representative 3 weeks prior to application for Certificate of Substantial Performance of the work.
- .4 Binding:
  - .1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
  - .2 Use vinyl, hard covered, 3 "D" ring binders, loose leaf, sized for 215 x 280 mm paper, with spine pocket.
  - .3 Where multiple binders are needed, correlate data into related consistent groupings.
  - .4 Identify contents of each binder on spine.
  - .5 Organize and divide data following same numerical system as the section numbers of the Specification Manual.
  - .6 Dividers: separate each section by use of cardboard dividers and labels. Provide tabbed fly leaf for each individual product and system and give description of product or component.
  - .7 Type lists and notes. Do not hand write.
  - .8 Drawings, diagrams and manufacturers' literature must be legible. Provide with reinforced, punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .5 Manual Contents:
  - .1 Cover sheet containing:
    - .1 Date submitted.
    - .2 Project title, location and project number.

- .3 Names and addresses of Contractor, and all Sub-Contractors.
- .2 Table of Contents: provide full table of contents in each binder(s), clearly indicate which contents are in each binder.
- .3 List of maintenance materials.
- .4 List of spare parts.
- .5 List of special tools.
- .6 Original or certified copy of warranties and product guarantees.
- .7 Copy of approval documents and certificates issued by Inspection Authorities.
- .8 Copy of reports and test results performed by Contractor as specified.
- .9 Product Information (PI Data) on materials, equipment and systems as specified in various sections of the specifications. Data to include:
  - .1 List of equipment including manufacturer's name, supplier, local source of supplies and service depot(s). Provide full addresses and telephone numbers.
  - .2 Nameplate information including equipment number, make, size, capacity, model number and serial number.
  - .3 Parts list.
  - .4 Installation details.
  - .5 Operating instructions.
  - .6 Maintenance instructions for equipment.
  - .7 Maintenance instructions for finishes.
- .6 Shop drawings:
  - .1 Include complete set of reviewed shop drawings into each copy of the operations and maintenance manual.
  - .2 Fold and bind material professionally in a manner that corresponds with the specification section numbering system.
  - .3 When large quantity of data is submitted, place into separate binders of same size as O&M binders.
- .7 Equipment and Systems Data: the following list indicates the type of data and extent of information required to be included for each item of equipment and for each system:
  - .1 Description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
  - .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
  - .3 Include installed colour coded wiring diagrams.
  - .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
  - .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

- .6 Servicing and lubrication schedule, and list of lubricants required.
- .7 Manufacturer's printed operation and maintenance instructions.
- .8 Sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports.
- .15 Additional requirements as specified in individual specification sections.
- .8 Materials and Finishes Maintenance Data:
  - .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
  - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
  - .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
  - .4 Additional Requirements: as specified in individual specifications sections.

## **1.7 SPARE PARTS, TOOLS AND MAINTENANCE MATERIALS**

- .1 Provide spare parts, special tools and extra materials for maintenance purposes in quantities specified in individual specification sections.
- .2 Tag all items with associated function or equipment.
- .3 Provide items of same manufacture and quality as items in Work.
- .4 Deliver to site in well packaged condition. Store in location as directed by Departmental Representative.
- .5 Clearly mark as to contents indicating:
  - .1 Part number.
  - .2 Identification of equipment or system for which parts are applicable.
  - .3 Installation instructions or intended use as applicable.
  - .4 Name, address and telephone number of nearest supplier.
- .6 Prepare and submit complete inventory list of items supplied. Include list within Maintenance Manual.

**END OF SECTION**

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**Part 1            GENERAL**

**1.1                SECTION INCLUDES**

- .1            This section deals with commissioning activities to occur during the construction stage and the early period of facility occupancy stage.
- .2            Section includes:
  - .1            Commissioning activities to be performed by the Contractor who is assigned membership on a Commissioning Team as part of the contract requirements.
  - .2            Commissioning activities to be performed by other members of the Commissioning Team.
- .3            In general, Contractor's commissioning activities consists of performing specified tasks and functions to assist the Commissioning Agent, along with other members of the commissioning team who will commission various components and systems of the Facility.

**1.2                RELATED SECTIONS**

- .1            Operations and Maintenance Manuals: Section 01 78 00.
- .2            Demonstration and Training: Section 01 79 00.

**1.3                BACKGROUND INFORMATION**

- .1            Historically in the past, the term commissioning has been used in reference to the process used to conduct testing, adjusting and balancing of the heating, ventilation and air conditioning (HVAC) systems of a building.
- .2            Commissioning (or the commissioning process), as understood by PCA, is a planned program of activities conducted in concert with other activities performed during each stage of project delivery.
  - .1            The commissioning process identifies issues during the Planning and Design stages which are addressed during the Construction and Occupancy Stages of a Facility to ensure that the built facility is constructed and proven to operate satisfactorily under all weather, environmental and occupancy conditions to meet operational and user requirements.
  - .2            Commissioning activities during the Construction stage incorporates a third party verification process and a transfer of critical operational knowledge to Facility personnel.



#### **1.4 COMMISSIONING OBJECTIVES**

- .1 A Commissioning Plan has been prepared by the Design Consultant, on behalf of PCA, which identifies, among other issues, specific commissioning activities to be carried out by the commissioning team during the Construction and Occupancy Stages of the project.
- .2 The commissioning activities have the following objectives:
  - .1 Collect data on equipment and systems being supplied and document their installation;
  - .2 Conduct checks and tests on fully installed building components, equipment, systems and integrated systems to:
    - .1 Verify whether they operate in accordance with requirements of Contract Documents;
    - .2 Verify performance against design criteria and user requirements and measure peak capacities;
  - .3 Prepare a Building Management Manual (BMM) which contains operations and maintenance data, as-built record documents, commissioning reports, training data and other critical information for future use by Facility operational staff;
  - .4 Ensure transfer of knowledge on the operations, maintenance and management of the Facility to Tenant and Operational personnel by means of appropriate training.
- .3 Work to achieve the above objectives requires a collaborative effort from all members of the commissioning team.
  - .1 Contractor's commissioning activities and responsibilities are described in Clause 1.8 below.
- .4 Commissioning activities performed by the Commissioning Agent and the Design Consultant does not replace checks, tests, adjustments, balancing and other performance verification procedures to be carried out by the Contractor as an integral part of performing the Work of this contract as specified in other sections of the Specifications.

#### **1.5 SYSTEMS TO BE COMMISSIONED**

- .1 The following systems and controls, complete with associated equipment and components, will be commissioned by the Commissioning Agent and requires related commissioning activities to be performed by Contractor as specified herein and in section(s):
  - .1 Plumbing
  - .2 Electrical

#### **1.6 DEFINITIONS**

- .1 For the purpose of this contract, the various terms listed below, as they relate directly or indirectly to the commissioning process, shall be deemed to have the following meaning.

- .2 Commissioning Process: a planned program of tasks, activities and procedures carried out systematically during the Construction and Occupancy Stages in accordance with the commissioning objectives, specified in clause 1.4.2 above, to:
  - .1 Verify whether the fully installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and;
  - .2 Ensure that appropriate documentation is compiled to effectively train O& M staff and prepare a comprehensive Building Management Manual (BMM).
- .3 Commission (ie: to commission a building component or system): tests and checks conducted by Commissioning Agent on all systems and integrated systems of Facility; carried out only after they are fully installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.
  - .1 Contractor provides assistance during this process by operating equipment and systems, by troubleshooting and making adjustments as may be required.
  - .2 Systems are run under their full operation and under various modes to determine if they function correctly, consistently, at peak efficiency and interactively with each other as intended in accordance with Contract Documents and design criteria.
  - .3 During these checks, adjustments may be made enhancing performance to meet environmental or user requirements.
- .4 Commissioning Agent: a specifically appointed person, representing the Departmental Representative, responsible for the development of a Commissioning Plan and managing it's implementation by overseeing and coordinating various activities and responsibilities to be performed by members of the Commissioning Team.
  - .1 In this project, the Commissioning Agent is part of the engineering consultant firm engaged by PCA to prepare the final design and contract documents for this Work.
  - .2 Commissioning Agent plays a lead role in support to the Departmental Representative to ensure that the commissioning objectives are achieved.
- .5 Commissioning Manager: a PCA departmental employee providing advice and guidance on commissioning requirements to the Commissioning Agent in support to the Departmental Representative.
- .6 Commissioning Plan: the document which describes the organization, scheduling, allocation of resources, required documentation, target dates, and team roles and responsibilities for verification that the built works meet Contract Document and design criteria requirements.
- .7 Contractor: means the General Contractor, however it also refers to any personnel from subcontractors, including the controls and TAB specialists, suppliers and manufacturer's technical persons which Contractor employs to carry out his/her designated commissioning duties and activities.

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- .8 Design Consultant: persons from the civil, architectural, mechanical and electrical design disciplines of the engineering firm(s) which have been engaged by the Departmental Representative to prepare the final design and produce the contract documents. Design Consultant also has specifically identified commissioning activities for this project.
  - .9 Design Criteria: All those factors included in the design of a Facility prescribed by the tenant needs or as determined by Designer as necessary in order to meet all Facility functional and user operational requirements
  - .10 Installation/Start-up Checks: (sometimes referred to as pre-functional checks) A written compilation of checks and inspections to be performed by Contractor during the pre-start-up and start-up of a particular equipment or system component.
    - .1 Checklist sheets are produced which include the following data:
      - .1 Product manufacturer's installation instructions and recommended checks and;
      - .2 Special procedures as specified in relevant sections of Specifications;
      - .3 Other items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
    - .2 Standard Installation/Start-Up Checklist sheets prepared by equipment manufacturer are acceptable for use. However, supplement with additional data representative of specific project conditions as deemed required by Commissioning Agent.
    - .3 Use Checklist sheets for all equipment installation. Document in writing on checklist the various checks made, deficiencies noted and corrective action taken.
    - .4 Installer to sign Checklist sheets upon completion, certifying that stated checks and inspections have been performed.
    - .5 Use of Installation/Start-Up Checklists shall not be considered part of the commissioning process but shall be stringently used for all equipment pre-start and start-up procedures.
    - .6 Return completed Installation/Start-Up Checklist sheets after use to Commissioning Agent for retention. Checklists are required by Commissioning Agent when Facility is commissioned and will be included in the BMM manual at completion of project.
  - .11 Performance Verification: (sometimes referred to Functional Testing) checks, running dynamic tests and adjustments carried out by Contractor on equipment and systems, upon their installation, to ensure they operate correctly, efficiently and function independently and interactively with other systems as intended in accordance with contract documents and manufacturer's recommendations.
    - .1 Performance Verification shall not be considered part of the commissioning process. It is however considered an essential and integral part of Contractor's responsibilities in the equipment installation process which must be stringently conducted, successfully completed and approved by Departmental Representative

before a piece of equipment or system is considered fully installed and functional.

- .2 Facility components and systems will not be commissioned by Commissioning Agent until performance verification has been completed and approved.
- .12 Performance Verification Report Sheets (PV sheets): forms developed by Commissioning Agent for Contractor's use to record measured data and readings taken during functional testing and Performance Verification procedures.
- .13 Product Information (PI Data): a compilation of data gathered on a particular piece of equipment, typically produced by manufacturer, which includes nameplate information, installation/startup instructions, parts list, operating instructions, maintenance guidelines and other pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of such equipment. This documentation is included in the Building Management Manual (BMM) at completion of work.

## **1.7 COMMISSIONING TEAM**

- .1 A commissioning team will be assembled to carryout various functions needed to effectively commission the Facility. Contractor shall be part of this team with duties and responsibilities as specified in this section and in other sections of the Specifications.
- .2 Members of the Commissioning Team are as follows:
  - .1 Commissioning Agent.
  - .2 Design Consultant.
  - .3 Contractor.
  - .4 Construction Commissioning Supervisor.
  - .5 Departmental Representative.
  - .6 PCA Commissioning Manager.
  - .7 PCA departmental personnel providing advice and project quality control to Departmental representative when required.
  - .8 Facility's operation and maintenance personnel staff as identified by Departmental Representative.
- .3 Effective commissioning requires coordination between members of the commissioning team. Cooperate with other team members in fulfilling assigned duties and as follows:
  - .1 Communicate commissioning objectives, to subcontractors, suppliers and manufacturers.
  - .2 Coordinate activities between subcontractors and trades as needed to carryout Contractor's assigned commissioning activities.
  - .3 Ensure attendance of subcontractors and required specialist at commissioning meetings and during the commissioning process.
- .4 Construction Commissioning Supervisor:

- .1 Assign a person, under Contractor's employ, to be the Construction Commissioning Supervisor.
- .2 Person to be knowledgeable and have past experience in commissioning of mechanical and electrical systems. Submit affidavit confirmation person's qualifications for Departmental Representative's review and approval.
- .3 Construction Commissioning Supervisor to coordinate and oversee all work activities and input required from subcontractors and applicable trades as required to make equipment, subsystems and system ready for commissioning and to conduct commissioning duties assigned to the Contractor.
- .4 Construction Commissioning Supervisor shall:
  - .1 Be the main point of contact, representing the Contractor, with whom the Commissioning Agent and Departmental Representative will to deal with in matters relating to commissioning.
  - .2 Attend all commissioning meetings and ensure that appropriate persons from subcontractors, trades, suppliers and manufacturers attend meetings when deemed required by Commissioning Agent or Departmental Representative.

## **1.8 CONTRACTOR'S COMMISSIONING ACTIVITIES**

- .1 General:
  - .1 Organize and arrange for the services of subcontractors, their specialists and manufacturer's technical representatives to perform Contractor's commissioning activities.
  - .2 Ensure that personnel forming part of the Commissioning Team are qualified and knowledgeable of installed equipment and systems and with design intent.
  - .3 Develop in conjunction with the Commissioning Agent a commissioning schedule as specified in clause 11.
  - .4 Notify Departmental Representative in writing when Facility is ready for be commissioned. Give 14 calendar day notice.
  - .5 Commissioning will only commence once that full documentation has been received and installed equipment and systems have undergone successful performance verification.
  - .6 Note that Certificate of Substantial Performance will only be issued when:
    - .1 All commissioning documentation has been received and found suitable by Departmental Representative;
    - .2 Designated equipment and systems have been commissioned and;
    - .3 Training has been completed.
  - .7 Performance faults:
    - .1 Equipment and systems found not operating correctly or not performing as intended during commissioning shall be re-verified by checking 100% of all equipment and components of the unfunctional system, including

- related controls as required to rectify the deficiencies and ensure correct performance.
- .2 Costs to conduct additional tests and inspections, as deemed required by Departmental Representative, to determine acceptability and proper performance of such item to be paid for by Contractor.
- .2 Prior to Facility being Commissioned:
    - .1 Submit commissioning documentation as specified in clause 13 below.
    - .2 Submit the Installation/Start-Up Checklist sheets to Commissioning Agent for review prior to conducting the pre-start and start-up of any piece of equipment. Incorporate additional start-up instructions onto checklist as determined by the Commissioning Agent's review.
    - .3 Conduct the pre-start and start-up of all equipment by following and filling out the approved Installation/Start-Up Checklists.
    - .4 Conduct Performance Verification on all installed equipment and systems. Use and fill out the PV Report Sheets provided.
    - .5 Upon completion of start-up and performance verification process, submit signed copy of Checklist and PV sheets to Commissioning Agent as affidavit that required checks and tests were successfully conducted.
    - .6 Record performance measurements and data reading on PV sheets and return to Commissioning Agent for compilation.
    - .7 Give Departmental Representative and Commissioning Agent a minimum of 5 days notice for start-up and performance verification of equipment and systems which must be witnessed by Commissioning Agent as determined by Commissioning Agent beforehand on PV sheets.
    - .8 Provide missing information and data as identified by Commissioning Agent and Departmental Representative during documentation review.
    - .9 Submit above noted documentation before Commissioning will proceed.
    - .10 Address deficiencies in Work identified during performance verification of equipment and systems. Conduct additional performance verification thereafter.
    - .11 Arrange for special tools and devices, identified at commissioning meeting(s), as deemed required to assist with commissioning.
    - .12 Provide access ladders, two way radios and other equipment required by Team when facility will be commissioned.
  - .3 When Facility is being Commissioned:
    - .1 Provide qualified tradespersons to be present at site to assist Commissioning Agent for the time period and commissioning activity including the following:
      - .1 Plumbing Sub-Contractor
      - .2 Electrical Sub-Contractor
    - .2 Assist in commissioning electrical systems specified and as follows:

- .1 Operate designated components, mechanical/electrical equipment and system under all modes of operation and conduct checks and tests as directed by Commissioning Agent.
- .2 Check and verify that building component, equipment, systems and integrated systems, including their controls, are functioning and responding correctly and interactively with each other.
- .3 Test systems independently and then in unison with other related systems.
- .4 Conduct all Commissioning checks and tests in presence of and witnessed by Commissioning Agent and Departmental Representative.
- .5 Assist Design Consultant and other members of the commissioning team who will also be present to commission Facility.
- .3 Specific procedures used to commission Facility will be provided by Commissioning Agent which includes:
  - .1 Sequential order of building component and system to be tested.
  - .2 Running systems under various anticipated modes and demands (example: high and low cooling or heating loads, duplicating outside temperature conditions, fire alarm and power failure conditions etc.).
  - .3 Running controls through all sequences of operation to verify and confirm that equipment and systems are responding as designed and intended.
  - .4 Operating designated equipment at peak capacities, recording output data against design criteria.
- .4 Run component or systems as long as necessary to effectively commission all items as deemed required by Commissioning Agent and Departmental Representative.
- .5 Monitor equipment and system responses.
- .6 Record test results, measurements and other data on commissioning forms provided by Commissioning Agent.
- .7 Assist in analysing results. Identify system deficiencies and components not responding as intended.
- .8 Correct deficiencies and system non-conformance issues. Adjust, calibrate or fine tune system components as required. Debug system software as may be required.
- .9 Retest systems when directed to confirm compliance.
- .4 Upon completion of Facility Commissioning:
  - .1 Provide training to maintenance & operational personnel as specified in clause 12 below.
  - .2 Turn over any filled-in checks sheets or reports resulting from commissioning.
- .5 During Warranty period at Occupancy Stage:
  - .1 After 10 months has elapsed from the commencement of the warranty period, conduct commissioning checks on the following building component and system:

- .1 Plumbing Systems
- .2 Electrical Systems
- .2 Fine tune components, systems and integrated systems and continue system debugging to optimize Facility performance.
- .3 Rectify warranty issues.
- .4 Submit written report to Commissioning Agent and Departmental Representative.
  - .1 Indicate results noted and corrective action taken.
  - .2 Note improvements made to operating parameters and control settings.
  - .3 Recommend modifications deemed advisable to improve performance, environmental conditions, energy consumptions and other issues.
- .5 Commissioning Agent and other team members as determined by Departmental Representative to be present during such work.

## **1.9 COMMISSIONING ACTIVITIES OF OTHER TEAM MEMBERS**

- .1 Commissioning Agent:
  - .1 Represents the Departmental Representative during the commissioning process.
  - .2 Coordinates activities of the commissioning team members to ensure that commissioning activities are carried out properly and in a timely manner.
  - .3 Prepares commissioning schedule in concert with Contractor.
  - .4 Chairs commissioning meetings.
  - .5 Works with Contractor, subcontractors, equipment suppliers, Design Consultant resources, PCA and Tenant Representatives to resolve technical problems which may arise during the process.
  - .6 Witnesses Contractor's pre-start, start-up and performance verification procedures for certain equipment and systems specified when deemed required due to their critical nature and function in the Facility.
  - .7 Verifies that Installation/Start-up Checklists and Performance Verification checks and tests are used and stringently followed by Contractor.
  - .8 Assists Contractor in coordination of training activities for facility staff.
  - .9 Submits final commissioning report to Departmental Representative.
- .2 Design Consultant:
  - .1 Prepares in concert with Commissioning Agent the Commissioning Plan.
  - .2 Reviews Contractor's Installation/Start-up Checklists for completeness, incorporating supplement data not addressed on checklist. Provides to Contractor checklist for products which manufacturer does not provide installation and start-up instructions.
  - .3 Develops performance verifications report sheets for use by Contractor to record actual data and measurements against design data criteria.



- .4 Includes, on performance verification report sheets, design data and anticipated performance values for equipment and systems to undergo verification.
- .5 Compiles commissioning documentation submitted by Contractor. Prepares final Building Management Manuals.
- .6 Assists Commissioning Agent in witnessing pre-start, start-up and performance verification activities.
- .7 Approves type and method of calibration for instruments used by Contractor to conduct performance verification and commissioning tests.
- .8 Assists Commissioning Agent in reviewing and analysing tests results.
- .9 Participate in the training sessions provided by Contractor to tenant O&M staff by giving introductory information on design philosophy, design intent and systems designs,
- .10 Assist in the resolution of issues relating to commissioning.
- .3 Tenant Representative:
  - .1 Participates with other team members to ensure that systems as installed meet the operational and functional requirements.
  - .2 Periodically attends commissioning meetings as required.
  - .3 Attends final commissioning activities.
  - .4 Assists in resolving technical problems by providing additional details on operational requirements.
- .4 Facility Operations and Maintenance Staff:
  - .1 Participates in the commissioning process to obtain early introduction to the facility systems and to provide early operator feedback.
  - .2 Prime interest is in the familiarization and training of appropriate maintenance staff.
  - .3 Staff may attend certain critical equipment start-up and performance verification activities and provide comments and practical suggestions on issues which may arise during actual operation, maintenance and repair of the equipment and systems.
  - .4 Attends commissioning meetings periodically, depending on issues being discussed.
  - .5 Identifies the appropriate staff which must receive the O&M training.

## **1.10 COMMISSIONING MEETINGS**

- .1 General briefing on commissioning will be conducted at first project construction meeting at commencement of work.
  - .1 Issues discussed will include scope and extent of commissioning and clarify responsibilities of commissioning team members.
  - .2 All team members must attend, including subcontractors of equipment and systems to be commissioned.

- .2 Include commissioning as one agenda item at each construction meeting held and chaired by Contractor during construction. Give subject due consideration for each material and equipment supplied and for all matters of Work.
- .3 At the 60% construction completion stage, as determined by Departmental Representative, a separate commissioning scope meeting will be called by Departmental Representative to review progress of work, discuss schedule of equipment start-up activities and prepare for upcoming commissioning. Issues at meeting will include:
  - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
  - .2 Determine the degree of involvement of each trade and manufacturer's representatives in the commissioning process.
- .4 Separate commissioning meetings will be held from the 60% construction stage to project completion. Meetings are tentatively scheduled to be held on a bi-monthly basis but may be more frequent during the equipment start-up and functional testing period.
- .5 Whenever possible meetings will be held immediately following the construction meetings.
- .6 Meeting will be chaired by Commissioning Agent, who will record and distribute minutes.
- .7 Ensure that all subcontractors and relevant manufacturer representatives are present at the 60% commissioning scope meeting and at other meetings as deemed required.

#### **1.11 COMMISSIONING SCHEDULE**

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

## 1.12 TRAINING

- .1 Commence process of familiarizing Tenant and O&M personnel in the early stages of work on purpose and operation of various equipment and systems. Continue process throughout the entire construction duration.
  - .1 Provide informal briefings during occasional site visits, at planned commissioning meetings and during the final commissioning site activities.
- .2 Conduct formal demonstration and training sessions only after all identified systems have been commissioned by Commissioning Agent and Departmental Representative has given approval to proceed with the training process.
- .3 Provide training and demonstration on equipment, sub-systems, systems and integrated systems as specified.
- .4 Carryout training in accordance with requirements of section 01 79 00.
- .5 Submit written agenda of training session(s) 4 weeks beforehand for review by Commissioning Agent and Departmental Representative.
- .6 Coordinate content with Commissioning Agent. Design Consultant will provide introductory presentation giving general outline of each system design and intended function.
- .7 Submit training manuals for review 2 weeks prior to actual training.
- .8 Ensure required tools and O&M Manuals are on site for training and system demonstration.
- .9 As a minimum, the training sessions to cover the following information:
  - .1 Introduction.
  - .2 Description of the system with factory personnel being involved at appropriate times.
  - .3 Instructions on start-up procedures including seasonal procedures, system check-lists and emergency procedures.
  - .4 Operational procedures, including occupancy considerations, seasonal change-over, manual and automatic operations and emergency modes.
  - .5 Instruction on system shutdowns, including checklists.
  - .6 Instructions on all aspects of system maintenance, including routine servicing, lubrication, overhaul and factory servicing.
  - .7 Information concerning the scope of warranties and their use.
  - .8 A description of spare parts in stock and their service.
  - .9 A description of normal tools required for servicing the systems/equipment.

- .10 Submit typewritten record of training sessions given and list of attendees. Use forms of format approved by Departmental Representative.

### **1.13 COMMISSIONING DOCUMENTATION**

- .1 Submit the following documentation for use during commissioning and for incorporation thereafter into a Building Management Manual (BMM):
  - .1 Operations and Maintenance Manuals, Project Record Documents and other data as specified in Section 01 78 00. Data to include:
    - .1 Equipment Product Information (PI Data) complete with:
      - .1 Nameplate info.
      - .2 Installation instructions.
      - .3 Operating procedures and
      - .4 Maintenance guidelines.
    - .2 Reviewed shop drawings.
    - .3 As-built record drawings and Specifications.
  - .2 Completed Installation/Start-up Checklist sheets used.
  - .3 Performance Verifications checks and tests procedures and completed report sheets used.
  - .4 Copy of any static and dynamic test and reports conducted.
  - .5 TAB report and other reports as specified in various trade sections.
- .2 Above documentation is required by Commissioning Agent to commission Facility. Submit data minimum 3 weeks before commencement of commissioning.
- .3 Documentation to include detailed information and number of copies as specified for maintenance manuals of section 01 78 00.
- .4 Commissioning Agent and Design Consultant will compile above documentation and produce a BMM manuals for operation/maintenance staff and tenant use.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    Definitions:
  - .1    Demolition: rapid destruction of building following removal of hazardous materials.
  - .2    Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
  - .3    Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.
    - .1    Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
    - .2    Indicates quantities of reuse, recycling and landfill.
  - .4    Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .2    Reference Standards:
  - .1    Health Canada/Workplace Hazardous Materials Information System (WHMIS)
    - .1    Material Safety Data Sheets (MSDS).
  - .2    Transport Canada (TC)
    - .1    Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

**1.2                ADMINISTRATIVE REQUIREMENTS**

- .1    Site Meetings.
  - .1    Convene pre-demolition meeting one week prior to beginning work of this Section to:
    - .1    Verify project requirements.
    - .2    Review installation and substrate conditions.
    - .3    Co-ordination with other building subtrades.
    - .4    Review manufacturer's installation instructions and warranty requirements.
  - .2    Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.
  - .3    Hold project meetings every week.
  - .4    Ensure key personnel attend.
  - .5    Reporting Requirements: WMC to complete.

- .6 Departmental Representative will provide written notification of change of meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .2 Scheduling: meet project time lines without compromising specified minimum rates of material diversion.
  - .1 Notify Departmental Representative in writing when unforeseen delays occur.

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

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.
  - .2 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.
- .3 Hazardous Materials:
  - .1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .4 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.

### **1.4 QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Federal regulations and PCA Environmental Policies.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures..
- .2 Storage and Protection.
  - .1 Protect in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
  - .2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.
  - .3 Remove and store materials to be salvaged, in manner to prevent damage.
  - .4 Store and protect in accordance with requirements for maximum preservation of material.

- .5 Handle salvaged materials as new materials.

## **1.6 SITE CONDITIONS**

### **.1 Site Environmental Requirements.**

- .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
  - .1 Ensure proper disposal procedures are maintained throughout the project.
- .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities as directed by Departmental Representative.
- .6 Protect trees, plants and foliage on site and adjacent properties where indicated.

### **.2 Existing Conditions.**

- .1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction as directed by Departmental Representative from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner.
- .2 List of hazardous materials:
  - .1 Asbestos (potential).
  - .2 Lead Paint (potential).

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

- .4 Disconnect and Cap Mechanical Services.
  - .1 Other Underground Services: remove and dispose of as directed by Departmental Representative in accordance with Section 33 71 73.02 - Underground Electrical Service.

### **3.2 REMOVAL OF HAZARDOUS WASTES**

- .1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

### **3.3 REMOVAL OPERATIONS**

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Removal of pavements and concrete:
  - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
  - .2 Protect adjacent joints and load transfer devices.
  - .3 Protect underlying and adjacent granular materials.
- .4 Excavate at least 300 mm below pipe invert, when removing pipes under existing pavement or concrete tunnels.
- .5 Obtain written approval of Departmental Representative prior to removal of trees.
- .6 Stockpile topsoil for final grading and landscaping:
  - .1 Provide erosion control and seeding if not immediately used.
- .7 Salvage:
  - .1 Items to be salvaged: embedded steel, top soil, wooden components.
  - .2 Dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated.
- .8 Disposal of Material:
  - .1 Dispose of materials not designated for salvage or reuse on site as instructed by Departmental Representative
  - .2 Trim disposal areas to approval of Departmental Representative .
- .9 Backfill:
  - .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **3.4 STOCKPILING**

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.



- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

### **3.5 REMOVAL FROM SITE**

- .1 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project.
- .2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .3 Transport material designated for alternate disposal using approved haulers facilities receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.
  - .1 Written authorization from Departmental Representative is required to deviate from haulers.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

### **3.6 RESTORATION**

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .3 Restore the site as close as possible to pre-construction condition focusing on re-vegetating sloped and cleared areas of the site with existing preserved sod mats, trees and shrubs and native plant/seed mix, trees and shrubs as directed by the Departmental Representative.

### **3.7 FIELD QUALITY CONTROL**

- .1 Verification requirements include:
  - .1 Materials and resources.
  - .2 Construction waste management.
  - .3 Resource reuse.
  - .4 Recycled content.
  - .5 Local/regional materials.
  - .6 Wood.

### **3.8 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.

- .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
- .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.9 PROTECTION**

- .1 Repair damage to adjacent materials or property caused by selective site demolition.

**END OF SECTION**

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**Part 1            General**

**1.1                SUMMARY**

- .1 Comply with requirements of this Section when performing following Work:
  - .1 Removal of asbestos containing material from piping equipment.
  - .2 Removal or disturbance of one square metre or less of friable asbestos containing material during the repair, alteration, maintenance or demolition of all or part of machinery or equipment, or of a building.
  - .3 Enclosure of friable asbestos containing material.
  - .4 Application of tape or sealant or other covering to pipe insulation containing asbestos.
  - .5 Removing non-friable asbestos containing materials by breaking, cutting, drilling, abrading, grounding, sanding or vibrating if:
    - .1 The material is not wetted to control the spread of dust or fibres, and
    - .2 The work is done only by means of non-powered hand-held tools.
  - .6 Removing non-friable asbestos containing materials by breaking, cutting, drilling, abrading, grounding, sanding or vibrating if the work is done by means of power tools that are attached to dust-collecting devices equipped with HEPA filters.
  - .7 Removing of asbestos containing material from a pipe, duct or similar structure using a glove bag.

**1.2                RELATED REQUIREMENTS**

- .1 Section 01 35 30 – Health and Safety Requirements.
- .2 Section 01 35 43 – Environmental Procedures.

**1.3                REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.205-94, Sealer for Application of Asbestos Fibre Releasing Materials.
- .2 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .5 Underwriters' Laboratories of Canada (ULC)

## 1.4 DEFINITIONS

- .1 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.
- .2 Asbestos Containing Materials (ACMs): materials that contain 0.5 0.1 provincial regulated amount per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.
- .3 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.
- .4 Authorized Visitors: Engineers, or designated representatives, and representatives of regulatory agencies.
- .5 Competent worker person: in relation to specific work, means a worker who:
  - .1 Is qualified because of knowledge, training and experience to perform the work.
  - .2 Is familiar with the provincial federal laws and with the provisions of the regulations that apply to the work.
  - .3 Has knowledge of all potential or actual danger to health or safety in the work.
- .6 Friable Materials: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
- .7 Glove Bag: prefabricated glove bag as follows:
  - .1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.
  - .2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.
  - .3 Equipped with reversible double pull double throw zipper on top and at approximately mid-section of the bag.
  - .4 Straps for sealing ends around pipe.
- .8 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.
- .9 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .10 Occupied Area: any area of building or work site that is outside Asbestos Work Area.
- .11 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .12 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.

- .3 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.
- .4 Submit proof of Contractor's Asbestos Liability Insurance.
- .5 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos containing waste and proof that asbestos containing waste has been received and properly disposed.
- .6 Submit proof satisfactory to Departmental Representative that all asbestos workers have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.
- .7 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.
- .8 Submit Worker's Compensation Board status and transcription of insurance.
- .9 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
  - .1 Encapsulants;
  - .2 Amended water;
  - .3 Slow drying sealer.
- .10 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

## **1.6 QUALITY ASSURANCE**

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.
- .2 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.
  - .2 Safety Requirements: worker and visitor protection.
    - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

- .1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.
- .2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn.
- .3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
- .4 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.
- .5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are located as indicated on drawings.
- .6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
- .7 Visitor Protection:
  - .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
  - .2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

- .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

## **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and/or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .4 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial/Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 mils bags or leak proof drums. Label containers with appropriate warning labels.
- .5 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

## **1.8 EXISTING CONDITIONS**

- .1 Reports and information pertaining to ACMS to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification immediately after this Section.
- .2 Notify Departmental Representative of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

## **1.9 SCHEDULING**

- .1 Hours of Work: perform work involving asbestos located at outside of normal working hours. Include in Contract Sum additional costs due to this requirement.

## **1.10 PERSONNEL TRAINING**

- .1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, in use of glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, at minimum:
  - .1 Fitting of equipment.
  - .2 Inspection and maintenance of equipment.
  - .3 Disinfecting of equipment.
  - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.

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**Part 2            Products**

**2.1                MATERIALS**

- .1 Drop and Enclosure Sheets:
  - .1 Polyethylene: 0.15 mm thick.
  - .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material.
- .3 Waste Containers: contain waste in two separate containers.
  - .1 Inner container: 0.15 mm thick sealable polyethylene bag or where glove bag method is used, glove bag itself.
  - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
  - .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.
- .4 Glove bag:
  - .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
  - .2 The glove bag to be equipped with:
    - .1 Sleeves and gloves that are permanently sealed to the body of the bag to allow the worker to access and deal with the insulation and maintain a sealed enclosure throughout the work period.
    - .2 Valves or openings to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.
    - .3 A tool pouch with a drain.
    - .4 A seamless bottom and a means of sealing off the lower portion of the bag.
    - .5 A high strength double throw zipper and removable straps, if the bag is to be moved during the removal operation.
- .5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
- .6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
  - .1 Sealer: flame spread and smoke developed rating less than 50 and be compatible with new fireproofing.



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**Part 3 Execution**

**3.1 SUPERVISION**

- .1 Minimum of one Supervisor for every ten workers is required.
- .2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

**3.2 PROCEDURES**

- .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.
- .2 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case 'Helvetica Medium' letters reading as follows, where number in parentheses indicates font size to be used: 'CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.
  - .1 Use HEPA vacuum or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.
  - .2 Do not use compressed air to clean up or remove dust from any surface.
- .4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
  - .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.
  - .2 When removing asbestos containing material from piping or equipment and "glove bag" method is not used erect enclosure of polyethylene sheeting around work area, shut off mechanical ventilation system serving work area and seal ventilation ducts to and from work area.
- .5 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.
  - .1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.
  - .2 Perform Work in a manner to reduce dust creation to lowest levels practicable.
- .6 Pipe Insulation Removal Using Glove Bag:
  - .1 A glove bag not to be used to remove insulation from a pipe, duct or similar structure if:
    - .1 It may not be possible to maintain a proper seal for any reason including, without limitation:
      - .1 The condition of the insulation.

- .2 The temperature of the pipe, duct or similar structure.
- .2 The bag could become damaged for any reason including, without limitation.
  - .1 The type of jacketing.
  - .2 The temperature of the pipe, duct or similar structure.
- .2 Upon installation of the glove bag, inspect bag for any damage or defects. If any damage or defects are found, the glove bag is to be repaired or replaced. The glove bag to be inspected at regular intervals for damage and defects, and repair or replaced, as appropriately. The asbestos containing contents of the damaged or defective glove bag found during removal are to be wetted and the glove bag and its contents are to be removed and disposed of in an appropriate waste disposal container. Any damaged or defective glove bags are not be reused.
- .3 Place tools necessary to remove insulation in tool pouch. Wrap bag around pipe and close zippers. Seal bag to pipe with cloth straps.
- .4 Place hands in gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag.
- .5 Insert nozzle of garden reservoir type sprayer into bag through valve and wash down pipe and interior of bag thoroughly. Wet surface of insulation in lower section of bag.
- .6 To remove bag after completion of stripping, wash top section and tools thoroughly. Remove air from top section through elasticized valve using a HEPA vacuum. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into waste container and seal.
- .7 After removal of bag ensure that pipe is free of residue. Remove residue using HEPA vacuum or wet cloths. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow drying sealer to seal in any residual fibres.
- .8 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethylene taped in place.
- .7 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
- .8 Cleanup:
  - .1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.
  - .2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.
  - .3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

- .4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
- .5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

### **3.3 AIR MONITORING**

- .1 From beginning of Work until completion of cleaning operations, Departmental Representative to take air samples on daily basis outside of Asbestos Work Area enclosures in accordance with Provincial Occupational Health and Safety Regulations.
  - .1 Contractor will be responsible for monitoring inside enclosure in accordance with applicable Provincial Occupational Health and Safety Regulations.
- .2 If air monitoring shows that areas outside Asbestos Work Area enclosures are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area.
- .3 Ensure that respiratory safety factors are not exceeded.
- .4 During the course of Work, Departmental Representative to measure fibre content of air outside Work areas by means of air samples analyzed by Phase Contrast Microscopy (PCM).
  - .1 Stop Work when PCM measurements exceed 0.05 f/cc and correct procedures.

**END OF SECTION**

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**Part 1            General**

**1.1                SUMMARY**

- .1    Comply with requirements of this Section when performing following Work:
  - .1    Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap on walls, ceilings.
  - .2    Removal of lead-containing coatings or materials using a power tool with an effective dust collection system equipped with a HEPA filter on walls, ceilings.
  - .3    Removal of lead-containing coatings or materials with non-powered hand tool, other than manual scraping and sanding on walls, ceilings.

**1.2                RELATED REQUIREMENTS**

- .1    Section 01 35 30 – Health and Safety Requirements.
- .2    Section 01 35 43 – Environmental Procedures.

**1.3                REFERENCES**

- .1    Department of Justice Canada
  - .1    Canadian Environmental Protection Act, 1999 (CEPA).
- .2    Health Canada
  - .1    Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).
- .3    Human Resources and Social Development Canada (HRSDC)
  - .1    Canada Labour Code Part II, - SOR 86-304 - Occupational Health and Safety Regulations.
- .4    Transport Canada (TC)
  - .1    Transportation of Dangerous Goods Act, 1992 (TDGA).
- .5    U.S. Environmental Protection Agency (EPA)
  - .1    EPA 747-R-95-007-1995, Sampling House Dust for Lead.
- .6    U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
  - .1    NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).
- .7    U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
  - .1    Lead in Construction Regulation - 29 CFR 1926.62-1993.
- .8    Underwriters' Laboratories of Canada (ULC)

#### 1.4 DEFINITIONS

- .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .2 Authorized Visitors: Departmental Representative or designated representatives.
- .3 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects over cuts and tears, and elsewhere as required to provide protection and isolation. For protection of underlying surfaces from damage and to prevent lead dust entering in clean area.
- .4 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.
- .5 Action level: employee exposure, without regard to use of respirators, to airborne concentration of lead of 50 micrograms per cubic meter of air ( $50 \text{ ug/m}^3$ ) calculated as 8-hour time-weighted average (TWA). Minimum precautions for lead abatement are based on airborne lead concentrations less than 0.05 milligrams per cubic meter of air for removal of lead based paint by methods noted in paragraph 1.1.
- .6 Competent person: individuals Departmental Representative capable of identifying existing lead hazards in workplace taking corrective measures to eliminate them.
- .7 Lead dust: wipe sampling on vertical surfaces and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

#### 1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of lead based paint waste in accordance with requirements of authority having jurisdiction.
- .3 Provide proof of Contractor's General Insurance.
- .4 Quality Control:
  - .1 Provide Departmental Representative necessary permits for transportation and disposal of lead based paint waste and proof that lead based paint waste has been received and properly disposed.
  - .2 Provide proof satisfactory to Departmental Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, and aspects of work procedures and protective measures.

#### 1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to lead paint, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.
- .2 Health and Safety:

- .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.
- .2 Safety Requirements: worker and visitor protection.
  - .1 Protective equipment and clothing to be worn by workers and visitors in work Area include:
    - .1 Respirator NIOSH approved and equipped with replaceable HEPA filter cartridges with an assigned protection factor of 10, acceptable to Authority having jurisdiction. Suitable for type of lead and level of lead dust exposure. Provide sufficient amount of filters.
    - .2 Half mask respirator: half-mask particulate respirator with N R P - series filter, and 95 99 100 % efficiency could be provided.
  - .2 Eating, drinking, chewing, and smoking are not permitted in work area.
  - .3 Ensure workers wash hands and face when leaving work area. Facilities for washing are located as indicated on drawings.
  - .4 Visitor Protection:
    - .1 Provide approved respirators to Authorized Visitors to work areas.
    - .2 Instruct Authorized Visitors procedures to be followed in entering and exiting work area.

## **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
- .3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of lead waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

## **1.8 EXISTING CONDITIONS**

- .1 Reports and information pertaining to lead based paint to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification immediately after this Section.
- .2 Notify Departmental Representative of lead based paint discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

## **1.9 SCHEDULING**

- .1 Not later than two days before beginning Work on this Project notify following in writing:
  - .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
  - .2 Provincial Ministry of Labour.
  - .3 Disposal Authority.
- .2 Inform sub trades of presence of lead-containing materials identified in Existing Conditions.
- .3 Provide Departmental Representative copy of notifications prior to start of Work.
- .4 Hours of Work: perform work involving lead paint abatement located at site outside of normal working hours. Include in Contract Sum additional costs due to this requirement.

## **1.10 PERSONNEL TRAINING**

- .1 Provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, and in use, cleaning, and disposal of respirators.
- .2 Instruction and training related to respirators includes, at minimum:
  - .1 Proper fitting of equipment.
  - .2 Inspection and maintenance of equipment.
  - .3 Disinfecting of equipment.
  - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.
- .4 Supervisory personnel to complete required training.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Polyethylene 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.
- .2 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.
- .3 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual lead paint residue.
- .4 Lead waste containers: metal fibre type acceptable to dump operator with tightly fitting covers and 0.15 mm thickness sealable polyethylene liners.
  - .1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

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**Part 3 Execution**

**3.1 SUPERVISION**

- .1 One Supervisor for every ten workers is required.
- .2 Supervisor must remain within work area during disturbance, removal, or handling of lead based paints.

**3.2 PREPARATION**

- .1 Remove and store items to be salvaged or reused.
  - .1 Protect and wrap items and transport and store in area specified by Departmental Representative.
- .2 Work Area:
  - .1 Shut off and isolate HVAC system to prevent dust dispersal into other building areas. Conduct smoke tests to ensure duct work is airtight.
  - .2 Pre-clean fixed casework and equipment within work area, using HEPA vacuum and cover and seal with polyethylene sheeting and tape.
  - .3 Clean work area using HEPA vacuum. If not practicable, use wet cleaning method. Do not raise dust.
  - .4 Seal off openings with polyethylene sheeting and seal with tape.
  - .5 Protect floor surfaces covered from wall to wall with polyethylene sheets.
  - .6 Maintain emergency fire exits or establish alternatives satisfactory to Authority having jurisdiction.
  - .7 Where water application is required for wetting lead containing materials, provide temporary water supply appropriately sized for application of water as required.
  - .8 Provide electrical power and shut off for operation of powered tools and equipment. Provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical cables and equipment.
- .3 Do not start work until:
  - .1 Arrangements have been made for disposal of waste.
  - .2 Tools, equipment, and materials waste containers are on site.
  - .3 Arrangements have been made for building security.
  - .4 Notifications have been completed and preparatory steps have been taken.

**3.3 LEAD ABATEMENT**

- .1 Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap; or removal equipped with HEPA filters; or removal with using power tools non-powered hand tool, other than manual scraping and sanding.
- .2 Remove lead based paint in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.



- .3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to staging area. Clean external surfaces thoroughly again by wet sponging. Wash containers thoroughly pending removal to outside. Ensure containers are removed by workers who have entered from uncontaminated areas dressed in clean coveralls.
- .4 After completion of stripping work, wire brush and wet sponge surface from which lead based paint has been removed to remove visible material. During this work keep surfaces wet.
- .5 After wire brushing and wet sponging to remove visible lead based paint, and after encapsulating lead containing material impossible to remove, wet clean entire work area, and equipment used in process. After inspection by Departmental Representative apply continuous coat of slow drying sealer to surfaces of work area. Do not disturb work area for 8 hours no entry, activity, ventilation, or disturbance during this period.

### **3.4 INSPECTION**

- .1 Perform inspection to confirm compliance with specification and governing authority requirements. Deviations from these requirements not approved in writing by Departmental Representative will result in work stoppage, at no cost to Owner.
- .2 Departmental Representative will inspect work for:
  - .1 Adherence to specific procedures and materials.
  - .2 Final cleanliness and completion.
  - .3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

### **3.5 LEAD SURFACE SAMPLING - WORK AREAS**

- .1 Final lead surface sampling to be conducted as follows:
  - .1 After work area has passed a visual inspection for cleanliness approved and accepted by Departmental Representative. Apply coat of lock-down agent to surfaces within enclosure, and appropriate setting period of 8 hours has passed, Departmental Representative will perform lead wipe sampling.
    - .1 Final lead wipe sampling results from horizontal and vertical surfaces must show lead levels of less than 40 micrograms of lead in dust per square foot. Samples collected and analyzed in accordance with EPA 747-R-95-007.
    - .2 If wipe sampling results show levels of lead in excess of 40 micrograms per square foot, re-clean work area at contractor's expense and apply another acceptable coat of lock-down agent to surfaces.
    - .3 Repeat as necessary until fibre levels are less than 40 micrograms per square foot.

### **3.6 FINAL CLEANUP**

- .1 Following cleaning and when lead wipe surfaces sampling are below acceptable concentrations, proceed with final cleanup.

- .2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum.
- .3 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.
- .4 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.

**3.7 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS**

- .1 Repair or replace objects damaged in course of work to their original state or better, as directed by Departmental Representative.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 35 30 – Health and Safety Requirements.
- .2    Section 01 35 43 – Environmental Procedures.

**1.2                REFERENCES**

- .1    American Conference of Governmental Industrial Hygienists (ACGIH), Bioaerosols Assessment and Control 1999.
- .2    Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1    Material Safety Data Sheets (MSDS).
- .3    New York City Department of Health - Bureau of Environmental and Occupational Disease Epidemiology's Guidelines on the Assessment and Remediation of Fungi in Indoor Environment 2000
- .4    United States Department of Labor Occupational Safety and Health Administration (OSHA)
  - .1    29 CFR 1910.134 - Respiratory Protection.
  - .2    29 CFR 1910.1200 - Hazard Communication.
- .5    United States Environmental Protection Agency (EPA), Mould Remediation in Schools and Commercial Buildings, 2001.

**1.3                DEFINITIONS**

- .1    Authorized Visitors: Engineers, Consultants or designated representatives, and representatives of regulatory agencies.
- .2    Cleaning solution: detergent solution.
- .3    Competent person: individuals Departmental Representative who can demonstrate that mould remediation training has been obtained, is capable of identifying existing microbial hazards in workplace and selecting appropriate control strategy for microbial exposure.
- .4    Contractor: remediation contractor providing demolition and removal services as defined in specification.
- .5    Fibre Reinforced Polyethylene Sheet: rip-proof fibre reinforced polyethylene sheeting with added fibre reinforced adhesive tape along edges.
- .6    HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .7    HVAC: heating ventilating and air-conditioning systems which serve occupied areas. Includes but is not limited to air handling units, duct work, terminal boxes and vents.

- .8 Mould contaminated work area: specific area or location where actual work is being performed or other areas of facility where it has been determined that it may be hazardous to public health as result of mould remediation.
- .9 Occupied Area: areas of building or work site that is outside mould contaminated work area.
- .10 PPE: Personnel Protection Equipment.
- .11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have a minimum of six litres capacity for work.

#### **1.4 REGULATORY REQUIREMENTS**

- .1 Comply with regulations in effect at time work is performed. In case of conflict among these requirements or with these specifications the more stringent requirement applies. If no regulations exist, follow guidelines most widely accepted by recognized professional organizations such as occupational hygienists, health professionals or environmental engineers as listed in paragraph 1.2 References.

#### **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit Provincial and/or local requirements for Notice of Project form.
- .2 Submit proof of Contractors Liability Insurance for dealing with hazardous materials.
- .3 Submit Workers Compensation Board status and transcription of insurance.
- .4 Submit proof of attendance in form of certificate that supervisory personnel have trained in asbestos and/or mould remediation course, approved by Departmental Representative. Minimum of one supervisor for every ten trained workers.

#### **1.6 CLOSEOUT SUBMITTALS**

- .1 Maintain general log to provide permanent record of project. Maintain logs and other required documentation as part of permanent project file.
- .2 Daily log must be available for inspection upon request by Departmental Representative.
- .3 Visitor log must be available for inspection upon request by Departmental Representative.

#### **1.7 INSTRUCTION AND TRAINING**

- .1 Before commencing work, provide Departmental Representative proof that worker had instruction and training in potential health hazards of mould exposure, handling of hazardous materials, in personal hygiene including protective clothing, in entry and exit from Mould Contaminated Work Area, and in use of disposal procedures including building materials. This training can be performed as part of a program to comply with requirements of the OHSA Hazard Communication Standard (29 CFR 1910.1200) equivalent.
- .2 Instruction and training related to respirators includes at minimum:
  - .1 Fitting of equipment.
  - .2 Inspection and maintenance of equipment.

- .3 Disinfecting of equipment.
- .4 Limitations of equipment.
- .3 Instruction and training must be provided by designated construction safety advisor.

## **1.8 WORKER PROTECTION**

- .1 Respirators suitable for protection against mould and acceptable to Provincial Authority having jurisdiction Non-powered disposable filter-type respirator of type half-face equipped with replaceable HEPA filter cartridges, personally issued to work and marked as to efficiency and purpose.
- .2 Gloves and eye protection.
- .3 Disposable paper coveralls including head covering.
- .4 Ensure that no person required to enter Mould Contaminated Work Area has facial hair that affects seal between respirator and face.
- .5 Eating, drinking and chewing are not permitted in Mould Contaminated Work Area.
- .6 Before leaving Mould Contaminated Work Area, dispose of protective clothing as waste as specified.
- .7 Ensure workers wash hands and face after leaving Mould Contaminated Work Area. Facilities for washing are located as indicated on drawings.

## **1.9 VISITOR PROTECTION**

- .1 Protective clothing and approved respirators Non-powered disposable filter-type respirator of type N95 OSHA 29CFR 1910.134 to be worn by Authorized Visitors to Mould Contaminated Work Area.
- .2 Instruct Authorized Visitors in use of protective clothing, respirators, and procedures.
- .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Mould contaminated work area.

## **1.10 HOURS OF WORK**

- .1 Typical work schedule – perform work after normal working hours and/or on weekends. Include in Contract Sum additional costs due to this requirement. Be available to work continuously from beginning to end of project.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Drop Sheets: fibre reinforced polyethylene 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
- .2 Disposal bags: dust-tight 0.15 mm clear polyethylene waste bags.
- .3 Wetting Agent: water to mist mould-containing material.
- .4 Cleaning solution: detergent solution for damp wipe and/or mop.

- .5 Fibre reinforced adhesive tape: used in sealing joints of fibre reinforced polyethylene sheets and for attachment of fibre reinforced polyethylene sheet to finished and unfinished surfaces. Fibre reinforced adhesive tape must be capable of adhering under both dry and wet conditions.
- .6 Materials: provide materials such as fibre reinforced polyethylene sheeting, lumber, nails and hardware necessary to construct and dismantle barriers that isolate Mould Contaminated Work Area.

## **2.2 TOOLS AND EQUIPMENT**

- .1 Tools and equipment: suitable for use with microbial contamination and must be able to withstand de-contamination.
- .2 Personnel protective equipment (protective clothing, personal respiratory filter cartridges, HEPA air filters, etc.): to be provided in sufficient quantities for duration of project.
- .3 Vacuum cleaners: equipped with HEPA filters.
- .4 Ladders and/or scaffolds: adequate length, strength and sufficient quantity to support work schedule.
- .5 Exhaust air fan systems: equipped with HEPA filters and be capable of providing sufficient exhaust air to create a minimum pressure differential of 5 to 7 Pa and to allow sufficient flow of air through area.

## **Part 3 Execution**

### **3.1 PREPARATION OF MOULD CONTAMINATED WORK AREA**

- .1 Mould Contaminated Work Area and areas adjacent and around area to be unoccupied. Vacating is recommended in case of infants (less than 12 months old), elderly people, persons having undergone recent surgery, immune suppressed people or people with chronic inflammatory lung diseases.
- .2 One supervisor for every ten trained workers is required.
- .3 Approved supervisor must remain within Mould Contaminated Work Area at all times during disturbance, removal or other handling of mould-contaminated materials.
- .4 Turn off HVAC systems prior to starting remediation work to prevent contamination and dust dispersal to other areas of building.
- .5 Seal off windows, doorways, skylights, ducts, grilles, diffusers and other openings between Mould Contaminated Work Area and uncontaminated areas outside Mould Contaminated Work Area with fibre reinforced polyethylene sheeting and fibre reinforced adhesive tape to minimize migration of contaminants to other parts of building.
- .6 Clean movable objects within proposed Mould Contaminated Work Area using HEPA filtered vacuum equipment, damp wipe surfaces and remove such objects from Mould Contaminated Work Area to a secure and clean area.

- .7 Clean fixed objects within proposed Mould Contaminated Work Area using HEPA filtered vacuum, damp wipe surfaces and cover with one layer of fibre reinforced polyethylene sheeting securely fastened with fibre reinforced adhesive tape.
- .8 Remove visible dust from surfaces in Mould Contaminated Work Area where dust is likely to be disturbed during course of mould remediation work. Use HEPA vacuum and damp wipe the area.
- .9 Do not use compressed air to clean up or remove dust from any surface.
- .10 Erect critical barriers around perimeter of Mould Contaminated Work Area before remediation using single layer of 0.15 mm fibre reinforced polyethylene sheeting extending from floor slab to as close as possible to underside of above floor slab. Seal gaps due to ductwork, piping conduits with layer of 0.15 mm fibre reinforced polyethylene sheeting. For larger areas, a steel or wooden stud frame can be erected and fibre reinforced polyethylene sheeting attached to it.
- .11 Use 0.15 mm fibre reinforced drop sheets tightly sealed with fibre reinforced adhesive tape over flooring in work areas.
- .12 Ensure that containment area is under negative pressure. Use HEPA filtered fan exhausted outside of Mould Contaminated Work Area to create negative pressure.
- .13 In smaller easily contained areas, use HEPA vacuum cleaner nozzle within enclosure. Locate vacuum canister outside enclosure.
- .14 Before beginning work, at each access to contaminated work area, install warning signs in both official languages in upper case 'Helvetica Medium' letters reading as follows, where number in parentheses indicates font size to be used : 'CAUTION MOULD HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING MOULD DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.  
'CAUTION MOULD HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING MOULD DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'
- .15 Do not begin remediation work until barriers are inspected and authorization is given by Departmental Representative.

### **3.2 MICROBIAL REMEDIATION**

- .1 If remediation procedures are expected to generate dust or visible concentration of fungi is heavy (blanket as opposed to patchy coverage), then it is recommended that Maximum Precautions Section 02 85 00.03 for Mould Remediation be followed using full containment.
- .2 Use sprayer (low-velocity, fine-mist) to mist (not wet) materials containing mould to be scraped. Perform work to reduce dust creation to lowest levels practicable.
- .3 Non-porous and semi-porous materials can be cleaned using the cleaning solution and reused depending on depth to which microbial growth has penetrated substrate. Wood to be discarded if fungal growth has affected its soundness.
- .4 Porous materials insulation with more than 1 square metre of mould contamination and/or dampness to be removed, discarded and replaced.

- .5 Porous materials identified as lightly contaminated that can be cleaned by HEPA vacuuming washing damp wiping can be reused, but to be discarded and replaced if possible.
- .6 Dispose of contaminated building materials as specified.
- .7 During mould remediation, should Departmental Representative suspect contamination of areas outside enclosed Mould Contaminated Work Area, contractor to stop remediation work and immediately decontaminate affected areas. Eliminate causes of such contamination. Prohibit unprotected individuals from entering these contaminated areas until air and swab sampling and a visual inspection determines areas are free from contamination.
- .8 Notify Departmental Representative of mould contaminated material discovered during work and not apparent from drawings, specifications or report pertaining to work. Do not disturb such material pending instructions from Departmental Representative.

### **3.3 REPAIR AND CLEAN-UP**

- .1 During Mould Remediation and immediately after completion of mould remediation, clean enclosure starting within top of enclosure and working down to floor. Clean areas using HEPA vacuum and by damp mopping with cleaning solution.
- .2 Perform restoration of designated Mould Contaminated Work Area as specified.
- .3 Leave areas dry and visibly free from contamination, debris and dust.
- .4 After clean-up within barrier dismantle, barrier and dispose of as specified.
- .5 Perform final thorough clean-up of work areas and adjacent areas affected by work using HEPA vacuum and damp mopping with cleaning solution.

### **3.4 WASTE DISPOSAL**

- .1 Place debris and mould-containing waste in doubled-bagged dust-tight 0.15 mm fibre reinforced clear polyethylene waste bags. Treat drop sheets and disposable protective clothing as waste; fold these items to contain dust, and place in plastic bags. Securely seal bags.
- .2 Cover large items that have heavy mould growth with fibre reinforced polyethylene sheeting and sealed with fibre reinforced adhesive tape before they are removed from enclosure.
- .3 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum prior to removal from Mould Contaminated Work Area.
- .4 Remove waste bags from site and dispose. There is no special requirements for disposal of mouldy materials, as such they can be disposed of in landfill.

### **3.5 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS**

- .1 Return objects moved to temporary locations to their location. Ensure objects are cleaned before been moved into cleaned areas.
- .2 Remount objects removed to former positions.



- .3 Re-establish mechanical and electrical systems to proper working order. Install new filters into HVAC systems serving the affected area as part of remediation.

### **3.6 FINAL CLEARANCE**

- .1 Departmental Representative to conduct thorough visual inspection to detect visible accumulations of dust or bulk materials remaining in work area. Should dust, debris, microbial contamination, or residue be detected repeat cleaning, until area meets approval.
- .2 Before and after work, take air samples inside of Mould Contaminated Work Area enclosures in accordance with recommended guidelines.
- .3 Perform final air monitoring of Mould Contaminated Work Area provided area has passed visual inspection and an appropriate settling period of 12 hours has passed. If air monitoring results are deemed unacceptable by Departmental Representative areas are to be re-cleaned with HEPA vacuum and damp wiped until levels are found to be acceptable by Departmental Representative.

**END OF SECTION**

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## **PART 1      GENERAL**

### **1.1            SUMMARY**

1. Comply with requirements of this Section when performing following Work:
  1. Removing rodent or bird droppings.
2. Note: Bird and rodent droppings when disturbed can become airborne and inhaled by workers during clean-up. These droppings can contain micro-organisms that can cause human infections/disease. Health conditions associated with inhaling dust from droppings or contact with open wounds include but are not limited to Hypersensitivity Pneumonitis and Histoplasmosis.
  1. Hypersensitivity Pneumonitis, also known as allergic alveolitis is a lung disease in which the air sacs become inflamed when dust from droppings are inhaled. Symptoms include chills, fever, fatigue, dry cough and shortness of breath. These symptoms occur within 4-10 hours after exposure and persist for as little as 12 hours or as long as 10 days.
  2. Histoplasmosis is a lung infection caused by inhaling a fungus called *Histoplasma capsulatum* found in droppings. Symptoms are similar to pneumonia and include fever, chills, fatigue, chest pains, and a dry cough. These symptoms occur within 5-18 days after exposure.

### **1.2            SECTION INCLUDES**

1. Requirements and procedures for rodent or bird droppings abatement or contaminated materials of the type describe within.

### **1.3            RELATED SECTIONS**

1. Division 1- General Conditions

### **1.4            REGULATIONS AND CODES**

1. Perform work in accordance with current applicable environmental and occupational health regulations and codes.
2. Perform all work in compliance with the Newfoundland and Labrador Occupational Health and Safety Regulation.

### **1.5            WORKER PROTECTION**

1. The following personal protective equipment shall be provided and worn during the clean-up of rodent droppings.
  1. Disposable coveralls with a hood (e.g. Tyvek suit) to protect personal clothing from contamination with infective organisms.
  2. Rubber gloves
  3. Rubber boots

4. Full face respirators, NIOSH approved with high efficiency particulate air (HEPA) filters capable of excluding particles of 0.3 micron size or a supplied air respirator with full face piece. Dust and particle masks will not provide adequate protection and are not approved for this use.

## **1.6 VISITOR PROTECTION**

1. Provide clean protective clothing and equipment and approved respirators to Authorized Visitors. Instruct Authorized Visitors in the use of protective clothing, respirators, and Work Area entry and exit procedures.

## **1.7 SUBMITALS**

1. Regulatory Requirements: Obtain all necessary permits and approvals for the removal, transportation and disposal of hazardous materials prior to commencing hazardous materials prior to commencing hazardous materials abatement work. Submit copies of all permits and approvals to the consultant at least 5 days prior to commencing of work.

## **1.8 WASTE MANAGEMENT AND DISPOSAL**

1. Place materials defined as hazardous or toxic in designated containers.
2. Disposal of waste generated by removal activities must comply with Federal, Provincial and Municipal regulations. Dispose of waste in sealed double thickness 6 mil bags. Label containers with appropriate warning labels.

## **1.9 EXISTING CONDITIONS**

1. Notify Project Manager if material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Project Manager.

## **1.10 SCHEDULING**

1. Typical work schedule - Perform work during normal working hours and/or on weekends or other specified time as defined by the owner. Include in Contract Sum additional costs due to this requirement. Be available to work continuously from beginning to end of project. Include in Contract Sum additional costs due to this requirement.

## **1.11 OWNER'S INSTRUCTIONS**

1. Before beginning Work, provide Project Manager satisfactory proof that every worker has had instruction and training in hazards of bird or rodent dropping exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.
2. Instruction and training related to respirators includes, at minimum:
  1. Fitting of equipment.
  2. Inspection and maintenance of equipment.

3. Disinfecting of equipment.
4. Limitations of equipment.
3. Instruction and training must be provided by competent, qualified person.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

1. Drop and Enclosure Sheets.
  1. Polyethylene: 0.15 mm thick.
  2. FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
2. Waste Containers: contain waste in two separate containers.
  1. Inner container: 6mil thick sealable polyethylene bag.
  2. Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
  3. Labeling requirements: affix preprinted cautionary biohazard waste warning, in both official languages, that is visible when ready for removal to disposal site.
3. Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions.

## **PART 3 EXECUTION**

### **3.1 SUPERVISION**

1. Minimum of one Supervisor for every five workers is required.
2. Approved supervisors must remain within the Work Area during disturbance, removal, or other handling of rodent or bird droppings.

### **3.2 PROCEDURES**

1. Clean-up
  1. Rope off areas and post signs denoting the area as hazardous, restricted and/or no entry.
  2. Do not remove rodent droppings in public buildings during normal working hours. If possible, schedule the removal during periods of minimum building use. Protect interior air by closing all heating and cooling system air intakes during the cleanup (shut down the entire ventilation system if possible).
  3. Should rodent droppings be suspected under fiberglass batt insulation, the contractor shall lightly mist spray the insulation prior to and during the removal of the batt insulation. Once the batt insulation has been removed and disposed off, continue to wet the rodent droppings with a low pressure mist spray to prevent debris and any pathogens from

becoming airborne. If the amount of droppings are excessive, repeat wetting will be necessary during the cleanup. A high-powered water hose is not recommended due to the potential of scattering the rodent droppings before they can be adequately wetted. However, hosing may be used for removing small amounts of recently deposited droppings from sidewalks and pavement.

4. Once the rodent dropping have been wetted, remove the dropping by either shovelling or scraping the material with a plastic spatulas or brushes with soft bristles to prevent damage to building surfaces.
  5. This material is to be double bagged, sealed and disposed in regular garbage.
  6. Once removal has been completed, spray and thoroughly soak all areas which were contaminated with droppings with a hypochlorite solution (1:9 javex/water).
2. Post Clean-up
1. Disposable coveralls, boots and gloves should be disinfected with the hypochlorite solution or vacuumed with a High Efficiency Particulate Aerosol (HEPA) vacuum before leaving the site.
  2. Place disposable coveralls in a plastic bag for disposal with the biohazardous waste.
  3. Remove respiratory protection and immediately disinfect before storing.
  4. Wash hands and any exposed skin after leaving the work-site.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 20 00 – Concrete Reinforcing
- .2 Section 03 30 00 – Cast-in-Place Concrete
- .3 Section 03 41 00 – Precast Structural Concrete

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3 CSA O121, Douglas Fir Plywood.
  - .4 CSA O151, Canadian Softwood Plywood.
  - .5 CSA O153, Poplar Plywood.
  - .6 CAN/CSA-O325.0, Construction Sheathing.
  - .7 CSA O437 Series, Standards for OSB and Waferboard.
  - .8 CSA S269.1, Falsework for Construction Purposes.
  - .9 CAN/CSA-S269.3, Concrete Formwork, National Standard of Canada

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of NL, Canada.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
- .4 Co-ordinate submittal requirements.
- .5 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings, Comply with CAN/CSA-S269.3 for formwork drawings.
- .6 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .7 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

## **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and/or recycling.
  - .2 Place materials defined as hazardous or toxic in designated containers.
  - .3 Divert wood materials from landfill to a reuse facility as approved by Departmental Representative.
  - .4 Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative.
  - .5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Formwork materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86.
  - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
  - .3 Rigid insulation board: to CAN/ULC-S701.
- .2 Pan forms: removable as indicated.
- .3 Form ties:
  - .1 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .4 Form liner:
  - .1 Plywood: Douglas Fir to CSA O121 Canadian Softwood Plywood to CSA O151 Poplar to CSA O153, grade, T and G edge, 19 mm thick.
- .5 Form release agent: non-toxic, biodegradable, low VOC,.
- .6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm<sup>2</sup>/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .7 Falsework materials: to CSA-S269.1.
- .8 Sealant: to Section 07 92 00 - Joint Sealants.

## **Part 3 Execution**

### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .12 Line forms for following surfaces:
  - .1 Outer face of outside.
  - .2 Exposed faces of abutments, wingwalls, piers and pylons: do not stagger joints of form lining material and align joints to obtain uniform pattern.
  - .3 Secure lining taut to formwork to prevent folds.
  - .4 Pull down lining over edges of formwork panels.
  - .5 Ensure lining is new and not reused material.
  - .6 Ensure lining is dry and free of oil when concrete is poured.
  - .7 Application of form release agents on formwork surface is prohibited where drainage lining is used.
  - .8 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
  - .9 Cost of textile lining is included in price of concrete for corresponding portion of Work.
- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

### 3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 3 days for walls and sides of beams.
  - .2 24 hours for footings.



- .2 Remove formwork when concrete has reached 70 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 03 41 00 – Precast Structural Concrete.

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 Measure reinforcing steel in kilograms tonnes of steel incorporated into Work, computed from theoretical unit mass specified in CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by Departmental Representative.
  - .2 No measurement will be made under this Section.
    - .1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

**1.3 REFERENCES**

- .1 American Concrete Institute (ACI)
  - .1 SP-66-04, ACI Detailing Manual.
- .2 ASTM International
  - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - .2 ASTM A143/A143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  - .3 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .4 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 CSA International
  - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA-A23.3, Design of Concrete Structures.
  - .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
  - .4 CSA-G40.20/G40.21-, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .6 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)

- .1 RSIC, Reinforcing Steel Manual of Standard Practice.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice SP-66.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland, Canada.
    - .1 Indicate placing of reinforcement and:
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
      - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
    - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
      - .1 Provide type B unless otherwise indicated.
  - .4 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.

#### **1.5 QUALITY ASSURANCE**

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
  - .1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
  - .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

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

- .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .5 Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.
- .6 Welded steel wire fabric: to ASTM A185/A185M.
  - .1 Provide in flat sheets only.
- .7 Welded deformed steel wire fabric: to ASTM A82/A82M.
  - .1 Provide in flat sheets only.
- .8 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .9 Mechanical splices: subject to approval of Departmental Representative.
- .10 Plain round bars: to CSA-G40.20/G40.21.

### **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 SP-66 Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
  - .1 SP-66 unless indicated otherwise.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
  - .1 Ship epoxy coated bars in accordance with ASTM A775A/A775M.

### **2.3 SOURCE QUALITY CONTROL**

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.

- .2 Upon request inform Departmental Representative of proposed source of material to be supplied.

### **Part 3 Execution**

#### **3.1 PREPARATION**

- .1 Galvanizing to include chromate treatment.
  - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

#### **3.2 FIELD BENDING**

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

#### **3.3 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
  - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
  - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Protect epoxy paint coated portions of bars with covering during transportation and handling.

#### **3.4 FIELD TOUCH-UP**

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

#### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 03 20 00 – Concrete Reinforcing

**1.2                PRICE AND PAYMENT PROCEDURES**

- .1            Measurement and Payment:

- .1            Measure cast-in-place concrete in sub-structure in cubic metres calculated from neat dimensions as indicated authorized in writing by Departmental Representative.
- .1            Concrete placed beyond dimensions indicated will not be measured.
- .2            No deductions will be made for volume of concrete displaced by reinforcing steel, structural steel, or piles.
- .3            No deductions will be made for volume of concrete less than 0.1 m<sup>2</sup> in cross sectional area in volume displaced by individual drainage openings.
- .4            Cast-in-place concrete in superstructure will not be measured but will paid for as fixed price item.
- .5            Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.
- .6            Measure supply and installation of waterstops in lineal metres installed.

**1.3                REFERENCES**

- .1            Abbreviations and Acronyms:

- .1            Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
- .1            Type GU, GUb and GUL - General use cement.
- .2            Type MS and MSb - Moderate sulphate-resistant cement.
- .3            Type MH, MHb and MHL - Moderate heat of hydration cement.
- .4            Type HE, HEb and HEL - High early-strength cement.
- .5            Type LH, LHb and LHL - Low heat of hydration cement.
- .6            Type HS and HSb - High sulphate-resistant cement.
- .2            Fly ash:
- .1            Type F - with CaO content less than 15%.
- .2            Type CI - with CaO content ranging from 15 to 20%.
- .3            Type CH - with CaO greater than 20%.
- .3            GGBFS - Ground, granulated blast-furnace slag.

- .2            Reference Standards:

- .1            ASTM International

- .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.
- .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .5 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- .6 ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .7 ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .8 ASTM D1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
  - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 CSA International
  - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation Meetings: in accordance with Section 01 14 10 – Scheduling and Management of Work, convene pre-installation meeting one week prior to beginning concrete works.
  - .1 Ensure key personnel, Departmental Representative, concrete producer, testing laboratories attend.
    - .1 Verify project requirements.

#### **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 At least 4 weeks prior to beginning Work, provide Departmental Representative with samples of materials proposed for use as follows:
  - .1 5 L of curing compound.



- .2 1 m length of each type of joint filler.
- .3 1 m length of each type of waterstops.
- .4 3 kg of each type of supplementary cementing material.
- .5 10 kg of each type of blended hydraulic cement.
- .6 5 kg of each admixture.
- .7 10 kg of each fine and coarse aggregate.
- .3 Provide testing inspection results reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .5 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .6 Provide two copies of WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

## **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.
- .4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- .5 Sustainability Standards Certification:
  - .1 Construction Waste Management: provide copy of plan.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by Departmental Representative.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .2 Packaging Waste Management: remove for reuse of pallets, crates, padding, packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 DESIGN CRITERIA**

- .1 Alternative 1 - Performance : to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.
- .2 Alternative 2 - Prescription: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

### **2.2 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

### **2.3 MATERIALS**

- .1 Portland Cement: to CSA A3001, Type GU HS.
- .2 Blended hydraulic cement: Type GUb HSb to CSA A3001.
- .3 Portland-limestone cement: Type GUL to CSA A23.1.
- .4 Supplementary cementing materials: with minimum 20% N GGBFS Type F CI CH fly ash replacement, by mass of total cementitious materials to CSA A3001.
- .5 Water: to CSA A23.1.
- .6 Aggregates: to CSA A23.1/A23.2.
- .7 Admixtures:
  - .1 Air entraining admixture: to ASTM C260.
  - .2 Chemical admixture: to ASTM C494, ASTM C1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

- .8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
  - .1 Compressive strength: 50 MPa at 28 days.
  - .2 Net shrinkage at 28 days: maximum 5 %.
- .9 Non premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 50 MPa at 28days.
- .10 Post-Tensioning Ducts: to CSA A23.1/A23.2.
- .11 Curing compound: to CSA A23.1/A23.2 .
- .12 Mechanical waterstops: ribbed extruded PVC of sizes indicated with prewelded corner and intersecting pieces with legs not less than 100 mm long :
  - .1 Tensile strength: to ASTM D412, method A, Die "C", minimum 10 MPa.
  - .2 Elongation: to ASTM D412, method A, Die "C", minimum 250%.
  - .3 Tear resistance: to ASTM D624, method A, Die "B", minimum 30 kN/m.
- .13 Premoulded joint fillers:
  - .1 Bituminous impregnated fiber board: to ASTM D1751.
  - .2 Sponge rubber: to ASTM D1752, Type I, flexible grade.
- .14 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.
- .15 Dampproof membrane:
  - .1 Kraft/polyethylene membrane:
    - .1 Membrane adhesive: as recommended by membrane manufacturer.

## 2.4 MIXES

- .1 Proportion normal density concrete in accordance with CSA-A23.1/A23.2, Alternative 1 to give following quality and yield for all concrete.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
  - .2 Provide concrete mix to meet following hard state requirements:
    - .1 Cement: Type GU Portland cement.
    - .2 Class of exposure: C1
    - .3 Compressive strength at 28 age: 35 Mpa minimum.
    - .4 Nominal size of coarse aggregate: 20 mm.
    - .5 Slump at time and point of discharge: 75 to 100 mm.
    - .6 Air content: 5 to 8 %.
  - .3 Provide quality management plan to ensure verification of concrete quality to specified performance.
  - .4 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

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**Part 3 Execution**

**3.1 PREPARATION**

- .1 Obtain Departmental Representative's written approval before placing concrete.
  - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
  - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

**3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
  - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
  - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
  - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
  - .5 Confirm locations and sizes of sleeves and openings shown on drawings.

- .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts:
  - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
  - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
    - .1 Formed holes: 100 mm minimum diameter.
    - .2 Drilled holes: to manufacturers' recommendations 25 mm minimum diameter larger than bolts used.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .4 Set bolts and fill holes with shrinkage compensating grout epoxy grout.
  - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .5 Finishing and curing:
  - .1 Finish concrete to CSA A23.1/A23.2.
  - .2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
  - .4 Finish concrete floor to CSA A23.1/A23.2. Class A.
  - .5 Provide swirl-trowelled finish unless otherwise indicated.
  - .6 Provide float finish unless otherwise indicated.
  - .7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .6 Waterstops:
  - .1 Install waterstops to provide continuous water seal.
  - .2 Do not distort or pierce waterstop in way as to hamper performance.
  - .3 Do not displace reinforcement when installing waterstops.
  - .4 Use equipment to manufacturer's requirements to field splice waterstops.
  - .5 Tie waterstops rigidly in place.
  - .6 Use only straight heat sealed butt joints in field.
  - .7 Use factory welded corners and intersections unless otherwise approved by Departmental Representative.
- .7 Joint fillers:
  - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.

- .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .3 Locate and form isolation, construction, expansion joints as indicated.
- .4 Install joint filler.
- .5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- .8 Dampproof membrane:
  - .1 Install dampproof membrane under concrete slabs-on-grade inside building.
  - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
  - .3 Seal punctures in dampproof membrane before placing concrete.
  - .4 Use patching material at least 150 mm larger than puncture and seal.

### **3.3 SURFACE TOLERANCE**

- .1 Concrete tolerance to CSA A23.1 Straightedge Method FF = 20 : FL = 15.

### **3.4 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 – Testing and Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.
  - .4 Compressive strength at 7 and 28 days.
  - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Contractor will pay for costs of tests as specified in Section 01 45 00 – Testing and Quality Control.
- .5 Contractor will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .7 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

### **3.5 CLEANING**

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

- .2 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Divert unused concrete materials from landfill to local quarry after receipt of written approval from Departmental Representative.
  - .2 Provide appropriate area on job site where concrete trucks and be safely washed.
  - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
  - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
  - .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
  - .7 Dispose of waste in accordance with applicable local, Provincial and National regulations.

**END OF SECTION**

Approved: 2009-12-31

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-25.20, Surface Sealer for Floors.
- .2 CSA International
  - .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
    - .1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements 01 35 43 - Environmental Procedures. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.
    - .2 Include application instructions for concrete floor treatments.

**1.3 ENVIRONMENTAL REQUIREMENTS**

- .1 Temporary lighting:
  - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
  - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
  - .1 Make work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature:
  - .1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:



- .1 Ensure concrete substrate is within moisture limits prescribed by CSA A23.1/23.2.
- .6 Safety:
  - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
  - .1 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **Part 2 Products**

#### **2.1 PERFORMANCE REQUIREMENTS**

- .1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

#### **2.2 SEALING COMPOUNDS**

- .1 Surface sealer: to CAN/CGSB-25.20, Type 1 - solvent-based, clear.
- .2 Sealants: maximum VOC limit 250 g/L.
- .3 Surface sealer: acrylic carnuba wax, colour: clear.
- .4 Surface sealers are not manufactured or formulated with aromatic solvents formaldehyde halogenated solvents mercury lead cadmium hexavalent chromium and their compounds.

#### **2.3 CURING COMPOUNDS**

- .1 Select low VOC, water-based, organic-solvent free curing compounds.

#### **2.4 MIXES**

- .1 Mixing ratios in accordance with manufacturer's written instructions.

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**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verify that slab substrate site conditions surfaces are ready to receive work and elevations are as indicated on drawings.

**3.2 PREPARATION OF EXISTING SLAB**

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.
- .2 Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.
- .3 Use mechanical stripping to remove chlorinated rubber or existing surface coatings.
- .4 Use protective clothing eye protection respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

**3.3 APPLICATION**

- .1 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .2 Clean over spray. Clean sealant from adjacent surfaces.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**3.5 PROTECTION**

- .1 Protect finished installation in accordance with manufacturer's instructions.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 03 20 00 – Concrete Reinforcing
- .2    Section 03 30 00 – Cast-in-Place Concrete

**1.2                MEASUREMENT PROCEDURES**

- .1    Measure precast elements in units supplied, delivered, stored and erected.
- .2    Precast elements measured as individual units, will include cost, supply, delivery, storage and erection of bearing assemblies removal and patching of erection devices transverse connections and field grouting of grout keys between precast members.

**1.3                REFERENCES**

- .1    Canadian Construction Documents Committee (CCDC)
  - .1    CCDC, Stipulated Price Contract.
- .2    Canadian General Standards Board (CGSB)
  - .1    CAN/CGSB-1.40, Anticorrosive Structural Steel Alkyd Primer.
  - .2    CAN/CGSB-1.181, Ready Mixed Organic Zinc-Rich Coating.
- .3    Canadian Standards Association (CSA International)
  - .1    CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2    CSA-A23.3-04, Design of Concrete Structures.
  - .3    CSA-A23.4-05, Precast Concrete - Materials and Construction.
  - .4    CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1    CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .5    CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
  - .6    CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .7    CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .8    CAN/CSA-S6, Canadian Highway Bridge Design Code.
  - .9    CSA-W47.1-03, Certification of Companies for Fusion Welding for Steel.
  - .10    CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .11    CSA-W59-03, Welded Steel Construction (Metal Arc Welding) (Metric version).
  - .12    CSA-W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4    Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

#### **1.4 DESIGN REQUIREMENTS**

- .1 Design precast elements to CSA-A23.3 CSA-A23.4 to carry handling stresses.
- .2 Design precast elements to carry loads as indicated in accordance with applicable codes.
- .3 Carry out vibration analysis and test if and as required by Departmental Representative.
- .4 Design connections/attachments of precast elements to load/forces specified by Departmental Representative.
- .5 Provide detailed calculations and design drawings for typical precast elements and connections as described in PART 1 - SUBMITTALS.

#### **1.5 PERFORMANCE REQUIREMENTS**

- .1 Tolerance of precast elements to CSA-A23.4.
- .2 Length of precast elements not to vary from design length by more than plus or minus 12 mm.
- .3 Cross sectional dimensions of precast elements not to vary from design dimensions by more than plus or minus 12 mm.
- .4 Deviations from straight lines not to exceed 5 mm in 1 m.
- .5 Precast elements not to vary by more than plus or minus 5 mm from true overall cross sectional shape as measured by difference in diagonal dimensions.

#### **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Submit shop drawings in accordance with CSA-A23.3 CSA-A23.4 and include following items:
  - .1 Design calculations for items designed by manufacturer.
  - .2 Details of prestressed and non-prestressed members, reinforcement and their connections.
  - .3 Camber.
  - .4 Finishing schedules.
  - .5 Methods of handling and erection.
  - .6 Openings, sleeves, inserts and related reinforcement.
- .4 Submit 2 copies of detailed calculations and design drawings for typical precast elements and connections for review by Departmental Representative weeks prior to manufacture.
- .5 Shop Drawings: submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of NL, Canada.

- .6 Submit samples in accordance with Section 01 33 00 - Submittal Procedures and provide sample and sample number of each finish to be used on project to Departmental Representative.

## **1.7 QUALITY ASSURANCE**

- .1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Departmental Representative verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

## **1.8 QUALIFICATIONS**

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate categories according to CSA-A23.4
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting bid and to specifically verify as part of tender that plant is currently certified in appropriate categories, Structural , Architectural, Concrete Ties.
- .3 Only precast elements fabricated in such certified plants to be acceptable to Departmental Representative and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

## **1.9 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.
- .2 Protect unit corners from contacting earth to prevent from staining.
- .3 Waste Management and Disposal:
  - .1 Separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **1.10 WARRANTY**

- .1 Contractor warrants that precast element will not spall or show visible evidence of corrosion of embedded steel and cracking, except for normal hairline shrinkage cracks, in accordance with General Conditions (GC) - CCDC GC 12.3, but for 5 years.
- .2 Contractor warrants that precast elements will not spall or show visible evidence of cracking, except for normal hairline shrinkage cracks, in accordance with subsection GC32.1 of General Conditions "C", but for 12 months warranty period, which is extended to 60 months.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Cement to CAN/CSA-A3001, Type GU.

- .2 Blended hydraulic cement: type GU to CAN/CSA-A3001.
- .3 Supplementary cementing materials: with minimum 15% GGBFS Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA A3001.
- .4 Water: to CSA-A23.1/A23.2.
- .5 Reinforcing steel: to CAN/CSA-G30.18, epoxy coated.
- .6 Prestressing steel tendons and bars: to CAN/CSA-S6.
- .7 Welded wire fabric: to ASTM A185/A185M.
- .8 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
- .9 Forms: to CSA-A23.4.
- .10 Anchors and supports: to CAN/CSA-G40.21 Type 300 W epoxy coated after fabrication.
- .11 Welding materials: to CSA W48.
- .12 Welding electrodes: to CSA W48 certified by Canadian Welding Bureau.
- .13 Epoxy coating: to ASTM A775/A775M.
- .14 Steel primer: to CAN/CGSB-1.40 MPI #23.
- .15 Zinc-rich primer: to CAN/CGSB-1.181 MPI #18.
- .16 Post-tensioning ducts: to CSA-A23.1/A23.2.
- .17 Air entrainment admixtures: to ASTM C260.
- .18 Shims: plastic.
- .19 Weephole tubes: purpose made galvanized steel plastic.
- .20 Insulation: expanded polystyrene to CAN/ULC-S701.

## 2.2 MIXES

- .1 Concrete:
  - .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with CAN/CSA-A23.1/A23.2.
    - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
    - .2 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
    - .3 Provide concrete mix to meet following hard state requirements:
      - .1 Cement: Type GU Portland cement.
      - .2 Class of exposure: C1
      - .3 Compressive strength at 28 age: 35 Mpa minimum.
      - .4 Nominal size of coarse aggregate: 20 mm.
      - .5 Slump at time and point of discharge: 75 to 100 mm.

.6 Air content: 5 to 8 %.

.2 Grout:

.1 Minimum compressive strength: 50 MPa.

.2 Shrinkage compensating grout: to Section 03 30 00 - Cast-in-Place Concrete.

## **2.3 MANUFACTURED UNITS**

.1 Manufacture units in accordance with CSA-A23.4.

.2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.

.3 Provide hardware suitable for handling elements.

.4 Shop prime anchors, steel inserts after fabrication and touch up primer on anchors after welding. Do not apply primer to embedded portion of anchor or inserts.

.5 Galvanize anchors, steel embedments after fabrication and touch up with zinc-rich primer after welding.

## **2.4 FINISHES**

.1 Finish units to commercial grade to CSA-A23.4.

## **2.5 SOURCE QUALITY CONTROL**

.1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4 CSA-G279.

.2 Provide records from in-house quality control programme based upon plant certification requirements to Departmental Representative for inspection and review.

.3 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

.4 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Departmental Representative for review upon request.

## **Part 3 Execution**

### **3.1 ERECTION**

.1 Do precast concrete work in accordance with CSA-A23.4, CSA-A23.3, CAN/CSA-S6.

.2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.

.3 Erect precast elements within allowable tolerances as indicated specified.

.4 Non-cumulative erection tolerances in accordance with CSA-A23-4.

.5 Set elevations and alignment between units to within allowable tolerances before connecting units.

- .6 Fasten precast units in place as indicated on reviewed shop drawings.
- .7 Secure with bolts using lockwashers.
- .8 Uniformly tighten bolted connections with torque indicated.
- .9 Do not weld or secure bearing plates at sliding joints.
- .10 Install precast concrete closures between stems of flanged units where indicated.
- .11 Use grout to align elevations of surfaces at joints. Slope grout not more than 1:12. Key in grout to 25 mm thickness.
- .12 Clean field welds with wire brush and touch-up shop primer with primer galvanized finish with zinc-rich primer.

### **3.2 VERIFICATION**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - PRODUCTS, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

### **3.3 CLEANING**

- .1 Use cleaning methods as reviewed by Departmental Representative before cleaning soiled precast concrete surfaces.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 CSA International
  - .1 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CSA S16-09, Design of Steel Structures.
  - .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5 CSA W59-M03, Welded Steel Construction (Metal Arc Welding) Metric.
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for sections and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
    - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of NL, Canada.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
  - .3 Construction Waste Management:
    - .1 Submit project Waste Management Plan Waste Reduction Workplan highlighting recycling and salvage requirements.

**1.3 QUALITY ASSURANCE**

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Steel sections and plates: to CSA G40.20/G40.21, 350W.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W49 Series.
- .4 Bolts and anchor bolts: to ASTM A307.
- .5 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

#### **2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

#### **2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.
- .2 Shop coat primer: MPI- EXT 5.1B.
- .3 Zinc primer: zinc rich, ready mix to MPI- EXT 5.2C.

## **2.4 SHOP PAINTING**

- .1 Primer: VOC limit 250 g/L maximum to GS-11 CCD-047a CCD-048.
- .2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .4 Clean surfaces to be field welded; do not paint.

## **2.5 PIPE RAILINGS**

- .1 Stainless Steel pipe: 38 mm nominal outside diameter, formed to shapes and sizes as indicated.
- .2 Galvanize exterior pipe railings after fabrication. Shop coat prime interior railings after fabrication.

## **2.6 CATCH BASIN COVERS AND FRAMES**

- .1 Steel fabricate from 30 mm galvanized steel grating as detailed set in L 55 x 55 x 6 frame.

## **2.7 SECURITY GATES**

- .1 Stainless Steel: formed to shapes and sizes as indicated.
- .2 Galvanize security gates after fabrication. Shop coat, prime and paint gates using a black epoxy coating after galvanizing.

## **Part 3 Execution**

### **3.1 EXAMINATION**

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

### **3.2 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16 Weld field connection.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.

### **3.3 PIPE RAILINGS**

- .1 Install pipe railings as indicated.
- .2 Set railing standards in concrete. Grout to fill hole. Trowel surface smooth and flush with adjacent surfaces.

### **3.4 TRENCH COVERS**

- .1 Install trench covers in locations as indicated.

### **3.5 CHANNEL FRAMES**

- .1 Install steel channel frames to openings as indicated.

### **3.6 SECURITY FENCING**

- .1 Install security fencing as indicated.
- .2 Set gates support bolts in concrete as indicated using Hiltiy Hy200 as per manufactures specifications.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.8 PROTECTION**

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

**END OF SECTION**

## **PART 1 GENERAL**

### **1.1 DEFINITIONS**

- .1 Boards: Lumber of less than 38 mm actual in thickness and 38 mm actual or greater width.
- .2 Dimension Lumber: Lumber of 38 mm actual or greater but less than 114 mm actual in least dimension.
- .3 Timber: Lumber of 114 mm actual or greater in least dimension.
- .4 Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - .1 NLGA: National Lumber Grades Authority.

### **1.2 QUALITY ASSURANCE**

- .1 Forest Certification: Provide wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, *FSC Principles and Criteria for Forest Stewardship*.

### **1.3 DELIVERY, STORAGE, AND HANDLING**

- .1 Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

## **PART 2 PRODUCTS**

### **2.1 WOOD PRODUCTS, GENERAL**

- .1 Lumber: Lumber: unless specified otherwise, softwood.
  - .1 In accordance with:
    - .1 CAN/CSA-O141.
    - .2 NLGA Standard Grading Rules for Canadian Lumber.
  - .2 Factory mark each piece of lumber with grade stamp of grading agency.
  - .3 Provide dressed lumber, S4S, unless otherwise indicated.

### **2.2 WOOD-PRESERVATIVE-TREATED LUMBER**

- .1 Preservative Treatment by Pressure Process: to CSA O80 Series 2.
  - .1 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

- .2 For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colourants, bleed through, or otherwise adversely affect finishes.
- .2 Do not use material that is warped or does not comply with requirements for untreated material.
- .3 Mark lumber with treatment quality mark of an inspection agency approved by the Canadian Lumber Standards Accreditation Board.
  - .1 For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- .4 Application: Treat all exterior wood products.

### **2.3 DIMENSION LUMBER FRAMING**

- .1 Maximum Moisture Content: 19% (S-dry) or less.
- .2 Non-Load-Bearing Framing: No. 2 grade and the following species:
  - .1 Spruce-pine-fir; NLGA.
- .3 Framing Other Than Non-Load-Bearing Framing: No. 2 grade and the following species:
  - .1 Spruce-pine-fir; NLGA.
- .4 Exposed Framing: Provide lumber hand selected for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

### **2.4 BOARDS**

- .1 Maximum Moisture Content: 19% (S-dry) or less.
- .2 Provide boards hand selected for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- .3 Board Decking: 32 mm- thick radius-edged decking of the following species and grades:
  - .1 Spruce-pine-fir, No. 1 Common grade, NLGA.
- .4 For other exposed boards, provide the following species and grades:
  - .1 Spruce-pine-fir, No. 1 Common grade, NLGA.
- .5 For concealed boards, provide lumber of the following species and grades:
  - .1 Spruce -pine-fir, Standard grade, NLGA.

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**2.5 TIMBER**

- .1 Maximum Moisture Content: No limit.
- .2 Dressing: Provide dressed timber (S4S) unless otherwise indicated.
  - .1 Spruce -pine-fir, Standard grade, NLGA.

**2.6 FASTENERS**

- .1 General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - .1 Provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
  - .1 Do not use electro-plated galvanized fasteners.
- .2 Nails, Brads, and Staples: CSA B111.
- .3 Power-Driven Fasteners: NES NER-272.
- .4 Wood Screws: ASME B18.6.1.
- .5 Lag Screws: ASME B18.2.3.8M.
- .6 Carbon-Steel Bolts: ASTM F 568M with ASTM A 563M hex nuts and, where indicated, flat washers, all hot-dip zinc coated.
- .7 Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - .1 Stainless-steel bolts and nuts complying with ASTM F 738M and ASTM F 836M, Grade A1 or A4.

**2.7 METAL FRAMING ANCHORS**

- .1 Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 25 mm above base and with 50mm minimum side cover, socket 1.6 mm thick, and standoff and adjustment plates 2.8 mm thick.

**2.8 MISCELLANEOUS**

- .1 Concrete: 35 MPa concrete to CSA-A23.1, as per Section 03 30 00 – Cast-in-Place Concrete.

**PART 3 EXECUTION**



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### **3.1 EXAMINATION**

- .1 Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- .1 Clean substrates of projections and substances detrimental to application.

### **3.3 POST FOOTINGS**

- .1 Provide concrete footings under every post. Extend footing down to load-bearing ground and either bedrock or below local frost lines whichever occurs first. Place concrete in 250 mm diameter form work. Finish concrete level with finish grade with smooth finish. Remove formwork to at least 100 mm below finished grade.
- .2 Reinstate landscaping upon completion of footings.

### **3.4 INSTALLATION, GENERAL**

- .1 Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- .2 Framing Standard: Comply with more stringent of NBCC 2015 Part 9 and these specifications.
- .3 Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- .4 Provide blocking and framing as indicated and as required to support other construction.
- .5 Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Use longest practical lengths.
- .6 Comply with manufacturer's instructions for applying field treatment to cut surfaces of preservative-treated lumber.
  - .1 Use inorganic boron for items that are continuously protected from liquid water.
  - .2 Use copper naphthenate for items not continuously protected from liquid water.
- .7 Securely attach rough carpentry work to substrate by anchoring and fastening.
- .8 Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish

materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

.9 For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

.1 Use finishing nails, unless otherwise indicated. Countersink nail heads.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Surface preparation.
- .2 Application of a waterproofing protection course.

**1.2 RELATED SECTIONS**

- .1 Section 03 30 00 - Cast-in-Place Concrete.
- .2 Section 33 46 16 – Subdrainage Piping.

**1.3 REFERENCES**

- .1 ASTM D6506 - Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing.

**1.4 SUBMITTALS**

- .1 Comply with Section 01 33 00 - Submittal Procedures.
- .2 Submit manufacturer's product data and application instructions.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- .2 Store materials in a clean, dry area in accordance with manufacturer's instructions.
- .3 Protect materials during handling and application to prevent damage or contamination.
- .4 Do not apply protection course over liquid-applied waterproofing membranes containing volatile solvents until all of the solvent has evaporated.

**1.6 ENVIRONMENTAL REQUIREMENTS**

- .1 Product not intended for uses subject to abuse or permanent exposure to the elements.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

1. Protection Course: Multi-ply, semi-rigid board, composed of a mineral-fortified asphaltic core formed between two outside layers of asphalt-impregnated fiberglass mat, weathercoated and covered with a polyethylene anti-stick sheet.

1. Performance Based Specification: protection course shall have the following characteristics based on ASTM D6506:
  1. Type 2:
    - .1 Puncture Strength, Class A & B: 312 N (70 lbf) minimum.
    - .2 Thickness, Class A & B: 2.4 mm to 3.9 mm.
    - .3 Water Absorption, Class A & B: 10 % maximum.
    - .4 Asphalt % by weight, Class A: 65 % minimum.
    - .5 Asphalt % by weight, Class B: 40 % minimum.
    - .6 Resistance to decay, Class A & B: Meets puncture requirements after completion of test.
  2. Foundation Wall Waterproofing or Dampproofing Membrane: High density polyethylene sheet, dimpled throughout field of sheet, with flat flanges on manufactured edges.
    - .1 Working Temperature Range: Minus 22°F (minus 30°C) to 176° F (80°C).
    - .2 Dimple Height: 5/16 inch (8mm)
    - .3 Compressive Strength: ASTM D 1621: Approximately 5200 psf (250 kN/sqm).
    - .4 Flange Width: 2 inch (50 mm).
    - .5 UV Stability: 30 days maximum UV exposure, however cover as soon as possible.
    - .6 Material Quality: Meeting minimum requirements of CCMC Technical Guide for Rigid Polyethylene or Polystyrene Dampproofing Membrane.
    - .7 Sheet Width: As required to result in as few seams as possible.
    - .8 Recycled content: 60 % post-consumer / post-individual HDPE.
  3. Accessories as recommended by the product manufacturer's installation instructions.

## **2.2 ACCESSORIES**

1. Joint Tape: Detail Strip as recommended by waterproofing manufacturer.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

1. Examine surfaces to receive protection course. Notify Departmental Representative if surfaces are not acceptable. Do not begin application until unacceptable conditions have been corrected.

### **3.2 SURFACE PREPERATION**

1. Prior to application, consult the waterproofing manufacturer to determine whether the polyethylene film facing on one side, or the asphalt-impregnated fiberglass mat on the other side of protection course, is approved as compatible to the specific waterproofing product being placed.
2. Clean and prepare surfaces to receive protection course in accordance with manufacturer's instructions.
3. If water testing is required, perform prior to application of protection course.

### **3.3 APPLICATION**

1. Horizontal Application
  1. Install protection course as soon as permissible by membrane applicator or manufacturer.
  2. Butt together all protection course sheet and cut to fit all intersecting surfaces and protrusions.
  3. Cover joints with joint tape if desired.
  4. Alternatively, cover joints with roofer's glass reinforced tape embedded in hot asphalt. Consult membrane manufacturer regarding this application for compatibility.
  5. Ensure wearing surface is applied as soon as possible following protection course application.
2. Vertical Application
  1. Install protection course as soon as permissible by membrane applicator or manufacturer.
  2. Butt together all protection course sheet and cut to fit all intersecting surfaces and protrusions.
  3. If necessary, temporarily hold protection course in place using recommended adhesive by membrane manufacturer.
  4. Backfill immediately using care and caution to avoid damage to waterproofing system.
  5. Do not drop backfill material against protection course in such a manner that it could drag the sheet down as backfill drops.

### **3.4 PROTECTION**

1. Apply protection course at the end of each day's waterproofing to both horizontal and vertical surfaces.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 GENERAL REQUIREMENTS**

- .1 The General Conditions, the Supplementary Conditions, the Instructions to Bidders and Division 1 General Requirements shall be read in conjunction with and govern this section.
- .2 The Specification shall be read as a whole by all parties concerned. Each Section may contain more or less than the complete work of any trade. The Contractor is solely responsible to make clear to the Subcontractors the extent of their work.

**1.2 SUMMARY**

- .1 This Section includes requirements for supply and installation of the following, as required for complete and proper installation:
  - .1 Fluid Applied Bituminous Dampproofing Membrane
  - .2 Fabric Reinforcement
  - .3 Flashing Membrane
  - .4 Mastics & Termination Sealants
  - .5 Protection Board
  - .6 Drainage Board
  - .7 Auxiliary Materials

**1.3 RELATED REQUIREMENTS**

- .1 Section 03 30 00 - Cast-In-Place Concrete
- .2 Section 03 41 00 - Precast Structural Concrete
- .3 Section 07 92 00 - Joint Sealants

**1.4 REFERENCES**

- .1 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB 37.2, Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing, and for Roof Coatings
  - .2 CAN/CGSB 37.16, Filled Cutback Asphalt for Dampproofing and Waterproofing
  - .3 CGSB 37-GP-6M, Asphalt, Cutback, Unfilled for Dampproofing

**1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Coordinate the Work of this Section with the installation of exterior substrate; Sequence work so that installation of fluid applied bituminous dampproofing membrane coincides with installation of substrate preparation without causing delay to the Work.
- .2 Pre-Construction Conference: Arrange a site meeting attended by the Contractor, the Subcontractor, the department representative, materials supplier(s), and other relevant personal

before commencement of work for this Section; as indicated in Section

- .1 Review methods and procedures related to installation, including manufacturer's written instructions;
- .2 Examine substrate conditions for compliance with manufacturers installation requirements;
- .3 Review temporary protection measures required during and after installation.

## **1.6 SUBMITTALS**

- .1 Provide requested information in accordance with Section 01 33 00 Submittals Procedures.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Product Data: Submit manufacturer's data sheets covering the care and recommended maintenance procedures for incorporation into maintenance manuals.
  - .2 Certifications:
    - .1 Submit copies of manufacturers' current ISO 9001 certification. Fluid applied bituminous dampproofing membrane, adhesives and associated auxiliary materials shall be included.
  - .3 Submit references clearly indicating that the fluid applied bituminous dampproofing membrane manufacturer has successfully completed projects on an annual basis of similar scope and nature for a minimum of fifteen (15) years. Submit references for a minimum of ten (10) projects.
  - .4 Submit manufacturers' complete set of standard details for the fluid applied bituminous dampproofing membrane showing a continuous plane of water tightness below grade.
  - .5 Provide material checklist complete with application rates and minimum thickness of adhesives and primers.

## **1.7 QUALITY ASSURANCE**

- .1 Qualifications: Provide proof of qualifications when requested by department representative:
  - .1 Submit in writing, a document stating that the applicator of the fluid applied bituminous dampproofing membrane specified in this section is recognized by the manufacturer as suitable for the execution of the Work.
  - .2 Perform Work in accordance with the manufacturer's written instructions of the fluid applied bituminous dampproofing membrane and this specification.
  - .3 Maintain one copy of manufacturer's written instructions on site.
  - .4 At the beginning of the Work and at all times during the execution of the Work, allow access to Work site by the fluid applied bituminous dampproofing membrane manufacturers' representative.
  - .5 Components used in this section shall be sourced from one manufacturer; including fluid applied bituminous dampproofing membrane, sealants, primers, mastics and adhesives.

## **1.8 MOCK-UPS**

- .1 Mock-ups: Construct mock-ups to verify selections made under submittals and to set quality standards for materials and execution for mock-ups and as follows:

- .1 Where directed by department representative, construct typical assembly, 2134mm x 2134mm (8' x 8'), incorporating substrate materials, fluid applied bituminous dampproofing membrane and adjacent materials including flashing, protection course, insulation, and drainage boards; showing fluid applied bituminous dampproofing membrane application details.
- .2 Notify department representative a minimum seven (7) days prior to mock-up construction.
- .3 Review and acceptance of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless department representative specifically notes such deviations in writing.
- .4 Once reviewed by department representative, acceptable mock-up can form a permanent part of the Work, and will form the basis for acceptance for the remainder of the project.
- .5 Remove and replace materials found not acceptable at no additional cost to Owner.

#### **1.9 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery: At the time of delivery, visually inspect all materials for damage. Note any damaged to materials on the receiving ticket and immediately report to the shipping company and the material manufacturer.
  - .1 Remove damaged materials from the site immediately.
- .2 Storage:
  - .1 Store materials as recommended by manufacturer and conforming to applicable safety regulatory agencies. Refer to all applicable data including but not limited to MSDS sheets, Product Data sheets, product labels, and specific instructions for personal protection.
  - .2 Store materials off the ground and cover with a weather proof flame resistant sheeting or tarpaulin.
  - .3 Store role materials on end in original packaging.
  - .4 Store fluid applied bituminous dampproofing in closed containers outdoors.
  - .5 Store adhesives and primers at temperatures of 5 deg C (41 deg F) and above to facilitate handling.
  - .6 Keep solvent away from open flame or excessive heat.
  - .7 Protect rolls from direct sunlight until ready for use.
- .3 Handling: Material shall be handled in accordance with sound material handling practices and in accordance with manufacturer's written instructions.

#### **1.10 COORDINATION**

- .1 Ensure continuity of the water seal throughout the scope of this section.
- .2 Ambient Conditions:
  - .1 Install materials outlined in this Section after completion of work by other Sections is complete; to provide adequate dry, clean, level, and plumb surfaces for installation and adhesion.
  - .2 Apply when ambient air and substrate temperatures are above temperature range indicated by fluid applied bituminous dampproofing membrane manufacturer, during time of install,



- and for a minimum of forty-eight (48) hours after installation, unless otherwise indicated.
- .3 Ensure surfaces are sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants.
  - .4 Ensure surfaces are dry prior to and a minimum of sixteen (16) hours after time of install.
  - .5 Do not permit traffic of any kind over unprotected bituminous dampproofing membranes. Apply protection course as soon as possible in accordance with manufacturers written instructions.

## 1.11 WARRANTY

- .1 Contractor Warranty: Warrant that the fluid applied dampproofing membrane and membrane flashings will stay in place and remain leak proof for two (2) years.
- .2 Manufacturer's Warranty: Fluid applied dampproofing membrane manufacturer must warranty the membrane and membrane flashings for leak coverage as a result of faulty materials for a period of five (5) years from the date of substantial completion.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- .1 Fluid Applied Bituminous Dampproofing Membrane
  - .1 Liquid applied medium consistency, solvent type waterproofing and dampproofing compound of selected asphalts and fibres permitting application in thick films; in compliance with CAN/CGSB 37.16-M89.
    - .1 Colour: Black
    - .2 Solids by Volume: 54%
    - .3 Application Temperature: Ambient (Thickens at low temperature).
    - .4 Water Vapour Permeance (ASTM E96): 2.9 ng/Pa.m<sup>2</sup>.s., (0.05 perms)
  - .2 Asphalt Primer
    - .1 Light bodied asphalt based material for priming surfaces for cold-applied dampproofing coatings, in compliance with CGSB 37-GP-9M.
      - .1 Colour: Black
      - .2 Solids by Volume: 37%
- .3 Protection Board:
  - .1 Extruded flexible twin wall board made of polypropylene copolymer and having the following physical properties:
    - .1 Thickness 2mm (80 mils)
    - .2 Tensile Strength Yield Point: 32 kg/cm<sup>2</sup>
    - .3 Tensile Strength Point of Failure: 242 kg/cm<sup>2</sup>
    - .4 Elongation: 167%
    - .5 Compression Strength (ASTM D695): 0.54 kg/cm<sup>2</sup>
    - .6 Impact Strength at 0 degrees C : 8.9 kg/cm
- .4 Drainage Boards:
  - .1 Composite two-part prefabricated geo-composite drain board consisting of a formed

polystyrene core covered on one side with a woven or non-woven polypropylene filter fabric.

.1 Vertical Applications: Designed for vertical installations requiring a high compressive strength and moderate flow capacity:

.5 Auxiliary Materials:

.1 Securement Bars: Continuous aluminum, stainless steel or galvanized metal, 3mm x 25mm x 25mm in size and shall be pre-drilled for non-corrosive screw attachment on a maximum of 200mm centers.

.2 Insulation: Extruded Polystyrene rigid board as indicated in Section 07 21 00 Thermal Insulation.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

.1 Verification of Conditions:

.1 Examine substrates to receive work and surrounding adjacent surfaces for conditions affecting installation.

.2 Concrete surfaces shall be smooth and without large voids, honeycombing, spalled areas or sharp protrusions.

.3 Notify Department Representative in writing of any discrepancies. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.

.2 Notify Contractor in writing of any conditions that are not acceptable.

.3 The installing contractor shall examine and determine that surfaces and conditions are ready to accept the Work of this section in accordance with published literature. Commencement of Work or any parts thereof shall mean installers acceptance of the substrate.

#### **3.2 PREPARATION**

.1 All surfaces must be sound, clean and free of oil, grease, dirt, excess mortar or other contaminants.

.2 Provide adequate protection of materials and work of this section from damage by weather, backfilling operations and other causes.

.3 Protect adjacent surfaces and Work of other trades from damage resulting from Work of this section. Make good such damage at no additional cost to the Owner.

.1 Provide sound handling and installation procedures to prevent and protect against overspray of materials specified in this Section.

#### **3.3 INSTALLATION**

.1 Fluid Applied Dampproofing Membrane Application:

.1 Primer: Apply penetrating asphalt primer at a rate of approximately 2 to 8m<sup>2</sup> (895 to 330ft<sup>2</sup>).and allow to cure.

.2 Dampproofing Application: Apply dampproofing coating at approximately 1.5 l/m<sup>2</sup> (3.6 gal/100ft<sup>2</sup>). Allow to dry thoroughly before applying board products and/or backfilling.

- .3 Waterproofing Application:
  - .1 Apply fabric reinforcement into dampproof coating at not less than 1.0 l/m<sup>2</sup> (2.4 gal/100ft<sup>2</sup>).
  - .2 Brush fabric reinforcement into place and eliminate wrinkles, air pockets or blisters and obtain full contact.
  - .3 Overlap fabric reinforcement at least 50mm (2") at all joints.
  - .4 At all corners, angles and junctions, reinforce with two (2) extra coats of dampproof coating and fabric reinforcement, at least 100mm (4") on each side of the junction.
  - .5 Apply a seal coat of dampproof coating over the entire area at not less than 1.0 l/m<sup>2</sup> (2.4 gal/100ft<sup>2</sup>).
- .2 Protection Board Installation:
  - .1 Install protection board over the fluid applied dampproofing membrane to prevent damage from backfilling.
  - .2 Apply protection board adhesive in 13mm (1/2") wide strips spaced at 457mm (18") o/c to fluid applied dampproofing membrane.
  - .3 Immediately embed protection board and press into adhesive to ensure full contact.
  - .4 Backfill once protection board adhesive has fully cured.
- .3 Drainage Board Installation:
  - .1 Attach drainage board to surface using adhesive. Permanent fixing is achieved once backfilling operation is complete.
  - .2 Vertical Application: Place drainboard with fabric side outwards.
    - .1 Start at the top or bottom of the wall. Drain board may be applied horizontally or vertically.
    - .2 When installed horizontally, position edge of core with flange at the top. When installed vertically, align edge with flange at the upstream edge.
    - .3 Bottom panel should be placed behind the discharge pipe.
  - .3 Overlaps: Pull back loose fabric to expose core. Position core of second panel over the overlap flange of first level.
    - .1 Overlap in direction of water flow and adhere the overlapped fabric with adhesive to prevent soils and/or concrete from entering core.
  - .4 Corners: Bend drainage board for inside corners. Cut drainage board to reach corner, providing 100mm (4") of extra fabric to wrap around corner. Overlap fabric at joint.

### 3.4 FIELD QUALITY CONTROL

- .1 Final Observation and Verification:
  - .1 Final inspection of fluid applied dampproofing membrane shall be carried out by the Owner's representative, and the contractor.
  - .2 Contact Manufacturer for warranty issuance requirements.
- .2 Fluid applied dampproofing membrane is not designed for permanent UV exposure. Apply protection board as soon as possible after installation of fluid applied dampproofing membrane. Refer to manufacturer published literature for product limitations.

**3.5 CLEANING AND PROTECTION**

- .1 Progress Cleaning: Leave work area clean at the end of each work day, ensuring safe movement of passing pedestrians.
- .2 Waste Management: Co-ordinate recycling of waste materials and packaging at appropriate facility, diverting waste from landfill. Certified installer shall be responsible for ensuring waste management efforts are practiced.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Urethane Foam Contractors Association Inc. (CUFCA)
- .2 Green Seal (GS)
  - .1 GS-11, Standard for Paints and Coatings.
- .3 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S101-07, Standard Methods of Fire Tests of Building Construction and Materials.
  - .2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .3 CAN/ULC-S705.1-01, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification. Includes Amendment 1.2.
  - .4 CAN/ULC-S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for polyurethane foam sprayed insulation and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Test Reports:
  - .1 Submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
- .4 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
- .5 Manufacturer's Reports:
  - .1 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

- .6 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

### **1.3 QUALITY ASSURANCE**

- .1 Applicators to conform to CUFGA Quality Assurance Program.
- .2 Qualifications:
  - .1 Installer: person specializing in sprayed insulation installations with documented experience.
- .3 Mock-up:
  - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
  - .2 Construct mock-up 10 m<sup>2</sup> minimum, of sprayed insulation including one inside corner and one outside corner, door, window openings.
  - .3 Mock-up may be part of finished work.
  - .4 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sprayed insulation work.
- .4 Health and Safety Requirements: worker protection:
  - .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
  - .2 Workers must wear eye protection gloves dust masks long sleeved clothing protective clothing respirators when applying foam insulation.
  - .3 Workers must not eat, drink or smoke while applying foam insulation.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect specified materials from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of padding, crates, packaging materials pallets, as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **1.5 SITE CONDITIONS**

- .1 Ventilate area as required.

- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hour after application to maintain non-toxic, unpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Insulation: spray polyurethane to CAN/ULC-S705.1.
  - .1 Spray Polyurethane Foam: Two-component spray polyurethane cellular plastic foam, complying with the follow methods and meeting the following physical properties.
    - .1 Core Density ASTM D1622: Minimum 2 pcf.
    - .2 Thermal Resistance ASTM C518: 140degreeF/90day Aged R-Value, measured at 75F mean Temp: Minimum R6.1/inch.
    - .3 Flame Spread ASTM E84, Class A: 25 or less.
    - .4 Smoke Developed ASTM E84, Class A: 450 or less.
    - .5 Compressive Strength minimum ASTM D1621, 182 kPa.
    - .6 Closed Cell Content ASTM D2856: minimum 90 percent.
    - .7 Water Absorption by Volume maximum. (ASTM D2842): 5.0 percent.
  - .2 Primers: in accordance with manufacturer's recommendations for surface conditions.
    - .1 Maximum VOC limit 100 g/L to GS-11 Standard.

## **Part 3 Execution**

### **3.1 EXAMINATION**

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

- .4 Sprayed foam installation is limited to the metal. Base metal to patched if compromised.

### **3.2 APPLICATION**

- .1 Apply insulation to clean surfaces in accordance with manufacturer's printed instructions CAN/ULC-S705.2.
- .2 Use primer where recommended by manufacturer.
- .3 Apply sprayed foam insulation in thickness as indicated 100 mm min.
- .4 Apply per the manufactures recommendations but lifts are not to exceed 50mm and allow for sufficient time to cool between lifts.

### **3.3 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**



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**PART 1 GENERAL**

**1.1 ACTION SUBMITTALS**

- .1 Product Data: For each joint-sealant product indicated.
- .2 Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 13 mm wide joints formed between two 150 mm long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- .3 Joint-Sealant Schedule: Include the following information:
  - .1 Joint-sealant application, joint location, and designation.
  - .2 Joint-sealant manufacturer and product name.
  - .3 Joint-sealant formulation.
  - .4 Joint-sealant color.

**1.2 INFORMATIONAL SUBMITTALS**

- .1 Qualification Data: For qualified Installer.
- .2 Warranties: Sample of special warranties.

**1.3 SUBMITTALS**

- .1 Product Data: For each joint-sealant product indicated.
- .2 Samples for Initial Selection: Manufacturer's colour charts consisting of strips of cured sealants showing the full range of colours available for each product exposed to view.
- .3 Joint-Sealant Schedule: Include the following information:
  - .1 Joint-sealant application, joint location, and designation.
  - .2 Joint-sealant manufacturer and product name.
  - .3 Joint-sealant formulation.
  - .4 Joint-sealant colour.
- .4 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- .5 Warranties: Sample of special warranties.

**1.4 QUALITY ASSURANCE**

- .1 Installer Qualifications: An experienced installer in the installation of sealants.
- .2 Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

- .3 Mock-ups: Install sealant in mock-ups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- .4 Preinstallation Conference: Conduct conference at Project site.

## **1.5 PROJECT CONDITIONS**

- .1 Do not proceed with installation of joint sealants under the following conditions:
  - .1 When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 5 deg C.
  - .2 When joint substrates are wet.
  - .3 Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - .4 Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## **1.6 WARRANTY**

- .1 Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - .1 Warranty Period: Two years from date of Substantial Completion.
- .2 Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  - .1 Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  - .2 Disintegration of joint substrates from natural causes exceeding design specifications.
  - .3 Mechanical damage caused by individuals, tools, or other outside agents.
  - .4 Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS, GENERAL**

- .1 Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- .2 VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when:
  - .1 Architectural Sealants: 250 g/L.

- .2 Sealant Primers for Nonporous Substrates: 250 g/L.
- .3 Sealant Primers for Porous Substrates: 775 g/L.
- .3 Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
  - .1 Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
  - .4 Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
  - .5 Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
  - .6 Colours of Exposed Joint Sealants: As selected by Owner's Representative from manufacturer's full range.

## **2.2 SILICONE JOINT SEALANTS**

- .1 Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

## **2.3 URETHANE JOINT SEALANTS**

- .1 Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

## **2.4 PREFORMED JOINT SEALANTS**

- .1 Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
- .2 Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 160 kg/cu. m and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

## **2.5 JOINT SEALANT BACKING**

- .1 General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- .2 Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O, (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- .3 Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## **2.6 MISCELLANEOUS MATERIALS**

- .1 Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- .2 Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- .3 Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- .1 Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - .1 Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - .2 Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - .1 Concrete.
    - .2 Masonry.
    - .3 Unglazed surfaces of ceramic tile.

- .4 Exterior insulation and finish systems.
- .3 Remove laitance and form-release agents from concrete.
- .4 Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
  - .1 Metal.
  - .2 Glass.
  - .3 Porcelain enamel.
  - .4 Glazed surfaces of ceramic tile.
- .2 Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- .3 Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### **3.3 INSTALLATION OF JOINT SEALANTS**

- .1 General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- .2 Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- .3 Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - .1 Do not leave gaps between ends of sealant backings.
  - .2 Do not stretch, twist, puncture, or tear sealant backings.
  - .3 Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- .4 Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- .5 Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - .1 Place sealants so they directly contact and fully wet joint substrates.
  - .2 Completely fill recesses in each joint configuration.
  - .3 Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- .6 Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth,

uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

- .1 Remove excess sealant from surfaces adjacent to joints.
- .2 Use tooling agents that are approved in writing by sealant manufacturer and that do not discolour sealants or adjacent surfaces.
- .3 Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- .4 Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
- .5 Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
  - .1 Use masking tape to protect surfaces adjacent to recessed tooled joints.
- .7 Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
  - .1 Apply masking tape to each side of joint, outside of area to be covered by sealant system.
  - .2 Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 10 mm . Hold edge of sealant bead 6 mm inside masking tape.
  - .3 Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
  - .4 Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- .8 Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

### **3.4 CLEANING**

- .1 Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### **3.5 PROTECTION**

- .1 Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### **3.6 JOINT-SEALANT SCHEDULE**

- .1 Joint-Sealant Colour: As selected by Owner's Representative from manufacturer's full range of colours.
- .2 Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - .1 Joint Locations:
    - .1 Construction joints in cast-in-place concrete.
    - .2 Joints between plant-precast architectural concrete units.
    - .3 Control and expansion joints in unit masonry.
    - .4 Joints in dimension stone cladding.
    - .5 Joints in glass unit masonry assemblies.
    - .6 Joints in exterior insulation and finish systems.
    - .7 Joints between metal panels.
    - .8 Joints between different materials listed above.
    - .9 Perimeter joints between materials listed above and frames of doors windows and louvers.
    - .10 Control and expansion joints in ceilings and other overhead surfaces.
    - .11 Other joints as indicated.
  - .2 Joint Sealant: any one of the following:
    - .1 Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50; Single component, nonsag, neutral curing, Class 50; Single component, nonsag, acid curing; Multicomponent, nonsag, neutral curing.
    - .2 Urethane Joint Sealant: Single component, nonsag, Class 100/50; Single component, nonsag, Class 50; Multicomponent, nonsag, Class 50.
    - .3 Preformed Joint Sealant: Preformed silicone; Preformed foam.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes: Permanent anti-graffiti coating system.

**1.2 QUALITY ASSURANCE**

- .1 Contractor Qualifications: Installer shall be a firm with not less than three years of successful experience in application of coatings of type required on substrates similar to those of this project. The firm shall be approved by the manufacturer of the coating for installation of their product.
- .2 Manufacturer's representative shall inspect substrate conditions including alkalinity and moisture content. Obtain written approval from representative before proceeding with work.
- .3 Meets ASTM-D7089 with Cleanability at least Level 2.
- .4 Meets ASTM-D6578 with Cleanability at least Level 9.

**1.3 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Instructions: Provide instructions bearing manufacturer's name, coating type, and recommended installation procedures. Provide methods and material instruction for graffiti removal. Include adhesive-backed graffiti removal instruction label suitable for application to interior surface.
- .3 Submit proof of purchase (Invoice of materials purchased) and proof of delivery of coating materials.
- .4 Manufacturer's Warranty: Submit one copy of manufacturer's warranty for specified materials.
- .5 Field Sample: Apply graffiti resistant coating to field mock-up sample representing exterior wall surface to be coated. Apply coating system over a minimum 3 ft x 3 ft test area and test removal of applied spray paint in presence of Construction Manager for approval using removal methods recommended by the manufacturer.

**1.4 EXTRA MATERIALS**

- .1 Furnish the following to building owner upon completion of the Project.
- .2 Provide four containers of removal products as recommended by the manufacturer accompanied by removal instructions.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Section 01 60 00 - Product Requirements: Transport, handle, store, and protect products.
- .2 Paint orders to the manufacturer or supplier shall identify the store number, location, and address of project. Contractor shall require a record keeping account be established and maintained by the paint supplier which records graffiti resistant paint type, brand, and quantity purchased, for the specific project.



- .3 Deliver coating materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and/or reducing.
- .4 Store materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F in ventilated area and as required by manufacturer's instructions.
- .5 Prevent fire hazards and spontaneous combustion.

## **1.6 WARRANTY**

- .1 Provide manufacturers written warranty guaranteeing effective graffiti removal for not less than 5 years and warrant that treated surfaces can be effectively and repeatedly cleaned of graffiti without damage or loss of effectiveness of the graffiti resistant coating. Manufacturer shall, for the duration of the warranty period, guarantee replacement of product and labor to remove graffiti and replace graffiti resistant coating where graffiti removal has shown to be ineffective.

## **1.7 PROJECT CONDITIONS**

- .1 Environmental Requirements: Follow manufacturer's recommendations for temperature range in which coating may be applied.

## **PART 2 PRODUCTS**

### **2.1 GRAFFITI RESISTANT COATING**

- .1 Graffiti resistant coating shall be a clear, non-sacrificial graffiti resistant coating which provides protection for exterior vertical and horizontal surfaces from permanent graffiti staining and damage caused by spray paint and marking pens. Coating shall be suitable for application to painted and unpainted surfaces including masonry, concrete, metals, and EIFS. Product shall be of type such that recoating with the underlying paint is possible without removal of the graffiti resistant coating. Product shall be a coating that dries clear, non-yellowing, with a low luster.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify all surfaces are ready to receive coating in accordance with manufacturer's printed requirements. Beginning of installation indicates acceptance of substrate.
- .2 Unpainted Concrete and Masonry: Verify water repellent has been applied to new or non-painted concrete and masonry surfaces prior to the application of the anti-graffiti coating.

### **3.2 PREPARATION**

- .1 Surface shall be free of dirt, dust, contaminants such as curing compounds, hardeners, bond breakers, and form release. Allow painted surfaces to cure properly. Do not water blast painted surfaces. Assure surfaces are clean and dry.
- .2 Mask or otherwise protect adjacent surfaces not scheduled to receive coating. If applied on unscheduled surfaces such as glass, remove immediately, by approved method.

- .3 Protect landscaping, property, and vehicles from over spray and drift.

### **3.3 APPLICATION**

- .1 Apply coating in accordance with manufacturer's published instructions.
- .2 Application Rate: Apply each coat at the manufacturers published application rate.

### **3.4 SURFACES TO BE COATED**

- .1 Apply graffiti resistant coating to all interior exposed surfaces visible from the ground level, including concrete, masonry, metal doors and frames, sheet metal items, downspouts, EIFS, stucco, wood, painted metal bollards, pneumatic tubing, and metal railing. Apply coating to painted and unpainted surfaces. Exclude horizontal surfaces subject to wheel or foot traffic.
- .2 Apply to exterior non-building vertical surfaces including solid or semi-solid fencing, segmental block or concrete panel retaining walls, and masonry screening as applicable.
- .3 On surfaces, apply coating system to first definitive continuous horizontal demarcation including change in paint color or surface material but not less than 12 feet above finish grade. Apply to full height of exterior overhead or coiling door surfaces. Apply to top of building if no definitive continuous horizontal demarcation lines exist..

### **3.5 MAINTENANCE**

- .1 Deliver cleaning products to Departmental Representative for storage and subsequent use for graffiti removal. Apply cleaning instructions label to interior wall location as directed by the Construction Manager.

### **3.6 FIELD QUALITY CONTROL:**

- .1 Verify application rate by periodic on-site inspection and calculation of area covered compared to consumption of coating material used. Document inspections showing total area covered and number and volume of coating containers used.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CSA C22.1, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
  - .2 CAN3-C235-, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

**1.2 DEFINITIONS**

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

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for dry type transformer, TECK cables, conduits and boxes.
- .3 Shop drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.
  - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, accessories, piping, and other items that must be shown to ensure co-ordinated installation.
  - .3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
  - .4 If changes are required, notify Departmental Representative of these changes before they are made.
- .4 Certificates:
  - .1 Provide CSA certified equipment.
  - .2 Where CSA certified equipment is not available, submit such equipment to authority having jurisdiction for special approval before delivery to site.
  - .3 Submit test results of installed electrical systems.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
  - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical

system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for dry type transformer.
  - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
  - .2 Operating instructions to include following:
    - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
    - .2 Start up, proper adjustment, operating, , and shutdown procedures.
    - .3 Safety precautions.
    - .4 Procedures to be followed in event of equipment failure.
    - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
  - .3 Post instructions where directed.
  - .4 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
  - .5 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions .
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect transformers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer and return of crates, packaging materials padding, pallets, as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2 Products**

**2.1 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates for control items in English and French.
- .4 Use one nameplate for both languages.

**2.2 MATERIALS AND EQUIPMENT**

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

**2.3 WIRING TERMINATIONS**

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

**2.4 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates as follows:
  - .1 Nameplates: 3 mm matt white finish face, white core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.
  - .2 Sizes as follows:

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

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate.

- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Terminal cabinets and pull boxes: indicate system and voltage.
- .7 Transformers: indicate capacity, primary and secondary voltages.

## 2.5 WIRING IDENTIFICATION

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

## 2.6 CONDUIT AND CABLE IDENTIFICATION

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

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

## 2.7 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Paint outdoor electrical equipment "equipment green" finish.
  - .2 Paint indoor switchgear and distribution enclosures light gray.

## Part 3 Execution

### 3.1 EXAMINATION

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

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

### **3.2 INSTALLATION**

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

### **3.3 NAMEPLATES AND LABELS**

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

### **3.4 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

### **3.5 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

### **3.6 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1400 mm.
  - .2 Wall receptacles:
    - .1 General: 300 mm.

### **3.7 CO-ORDINATION OF PROTECTIVE DEVICES**

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

### **3.8 FIELD QUALITY CONTROL**

- .1 Load Balance:

- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 – Testing and Quality Control.
- .1 Power generation distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
    - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### **3.9 SYSTEM STARTUP**

- .1 Instruct Departmental Representative in operation, care and maintenance of systems, system equipment and components.
- .2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.



**3.10 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

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**Part 1            General**

**1.1                REFERENCE STANDARDS**

- .1    CSA International
  - .1    CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
  - .2    CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2    National Electrical Manufacturers Association (NEMA)

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3                CLOSEOUT SUBMITTALS**

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

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2    Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3    Storage and Handling Requirements:
  - .1    Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2    Store and protect wire and box connectors from nicks, scratches, and blemishes.
  - .3    Replace defective or damaged materials with new.
- .4    Packaging Waste Management: remove for reuse and return by manufacturer of crates, packaging materials padding, pallets, as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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**Part 2 Products**

**2.1 MATERIALS**

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for TECK cable as required to: CAN/CSA-C22.2 No.18.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
  - .2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

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

**1.2                PRODUCT DATA**

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

**1.3                DELIVERY, STORAGE AND HANDLING**

- .1            Packaging Waste Management: remove for reuse by manufacturer and return of pallets packaging materials crates padding in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2            Products**

**2.1                BUILDING WIRES**

- .1            Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2            Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.
- .3            Copper conductors: size as indicated, with thermoplastic insulation type T90 Nylon rated at 600 V for grounding.

**2.2                TECK 90 CABLE**

- .1            Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2            Conductors:
  - .1            Grounding conductor: copper.
  - .2            Circuit conductors: copper, size as indicated.
- .3            Insulation:
  - .1            Cross-linked polyethylene XLPE.
  - .2            Rating:, 600 V.
- .4            Inner jacket: polyvinyl chloride material.
- .5            Armour: aluminum interlocking.
- .6            Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7            Fastenings:
  - .1            One hole malleable iron straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  - .2            Channel type supports for two or more cables at 1000mm.

- .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
  - .1 Watertight, approved for TECK cable.

**Part 3 Execution**

**3.1 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests before energizing electrical system.

**3.2 GENERAL CABLE INSTALLATION**

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors- (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

**3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

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

- .1 Group cables wherever possible on channels.
- .2 Install cable exposed, securely supported by straps.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 26 05 21 – Wires and Cables (0-1000V).

**1.2                REFERENCE STANDARDS**

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

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4                CLOSEOUT SUBMITTALS**

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

**1.5                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Store and protect grounding equipment from nicks, scratches, and blemishes.
  - .3            Replace defective or damaged materials with new.
- .4            Packaging Waste Management: remove for reuse by manufacturer and return of padding, pallets, crates, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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**Part 2 Products**

**2.1 EQUIPMENT**

- .1 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .2 Insulated grounding conductors: green, copper conductors, size as indicated.
- .3 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.
- .4 Outdoor, single 3 phase, delta .

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 Install bonding wire for flexible conduit, connected at one both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

- .7 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

### **3.3 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections to neutral of primary 600 V system, and secondary 208 V system.

### **3.4 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers and distribution panels.

### **3.5 FIELD QUALITY CONTROL**

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

### **3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**



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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

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

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions .
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Store and protect hangers and supports from nicks, scratches, and blemishes.
  - .3            Replace defective or damaged materials with new.
- .4            Packaging Waste Management: remove for reuse by manufacturer and return of packaging materials padding, pallets, crates, as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2            Products**

**2.1                SUPPORT CHANNELS**

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

**Part 3            Execution**

**3.1                EXAMINATION**

- .1            Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports installation in accordance with manufacturer's written instructions.
  - .1            Visually inspect substrate in presence of Departmental Representative.

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

### **3.2 INSTALLATION**

- .1 Secure equipment to solid masonry, tile and plaster surfaces with nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole malleable iron straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .6 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.
- .7 For surface mounting of two or more conduits use channels at 1000mm.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

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

**1.2                REFERENCE STANDARDS**

- .1            Canadian Standards Association (CSA International)
  - .1            CSA C22.1, Canadian Electrical Code, Part 1, 20th Edition.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4                DELIVERY, STORAGE AND HANDLING**

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

**Part 2            Products**

**2.1                JUNCTION AND PULL BOXES**

- .1            Construction: PVC enclosure.
- .2            Covers Flush Mounted: 25 mm minimum extension all around.
- .3            Covers Surface Mounted: screw-on covers.

**Part 3            Execution**

**3.1                JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

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

**3.2                IDENTIFICATION**

- .1            Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

- .2 Identification Labels: size 2 indicating voltage and phase or as indicated.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

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

**1.2                REFERENCE STANDARDS**

- .1            Canadian Standards Association (CSA International)
  - .1            CSA C22.1, Canadian Electrical Code, Part 1.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2            Waste Management and Disposal:
  - .1            Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2            Products**

**2.1                OUTLET AND CONDUIT BOXES GENERAL**

- .1            Size boxes in accordance with CSA C22.1.
- .2            102 mm square or larger outletboxes as required.
- .3            Gang boxes where wiring devices are grouped.
- .4            Blank cover plates for boxes without wiring devices.

**2.2                CONCRETE BOXES**

- .1            PVC concrete type boxes for flush mount in concrete with matching extension and plaster rings as required. Sizes as indicated.

**2.3                FITTINGS - GENERAL**

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

**Part 3            Execution**

**3.1                INSTALLATION**

- .1      Support boxes independently of connecting conduits.
- .2      Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3      For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4      Provide correct size of openings in boxes for conduit, and armoured cable connections. Do not install reducing washers.
- .5      Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6      Identify systems for outlet boxes as required.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 26 05 12 – Wire and Cable (0-1000V).
- .2    Section 26 05 29 – Hangers and Supports for Electrical.
- .3    Section 26 05 31 – Splitters, Junction, Pull Boxes and Cabinets.

**1.2                REFERENCE STANDARDS**

- .1    Canadian Standards Association (CSA International)
  - .1    CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2    CSA C22.2 No. 45, Rigid Metal Conduit.
  - .3    CSA C22.2 No. 56-, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4    CSA C22.2 No. 83, Electrical Metallic Tubing.
  - .5    CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
  - .6    CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4                WASTE MANAGEMENT AND DISPOSAL**

- .1    Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2    Place materials defined as hazardous or toxic waste in designated containers.
- .3    Ensure emptied containers are sealed and stored safely for disposal away from children.



**Part 2**

**Products**

**2.1 CABLES AND REELS**

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

**2.2 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with expanded ends with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal , aluminum.
- .6 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

**2.3 CONDUIT FASTENINGS**

- .1 One hole malleable iron straps to secure surface conduits 50 mm and smaller.
  - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Channel type supports for two or more conduits at 1000mm.
- .3 Threaded rods, 6 mm diameter, to support suspended channels.

**2.4 CONDUIT FITTINGS**

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

**2.5 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

**2.6 FISH CORD**

- .1 Polypropylene.

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in electrical service rooms.
- .3 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .4 Use epoxy coated conduit in corrosive areas.
- .5 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury except in cast concrete.
- .6 Use rigid PVC conduit underground.
- .7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .8 Minimum conduit size for lighting and power circuits: 19 mm.
- .9 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 19 mm diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire.

**3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Group conduits wherever possible on surface channels.
- .3 Do not pass conduits through structural members except as indicated.

**3.4 CONCEALED CONDUITS**

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

**3.5 CONDUITS IN CAST-IN-PLACE CONCRETE**

- .1 Locate to suit reinforcing steel.
  - .1 Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
  - .1 Use cold mastic between sleeve and conduit.
- .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

**3.6 CONDUITS UNDERGROUND**

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

**3.7 CLEANING**

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

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCE STANDARDS**

- .1    CSA International
  - .1    CAN/CSA-C22.2 No.47, Air-Cooled Transformers (Dry Type).
  - .2    CSA C9-, Dry-Type Transformers.
  - .3    CAN/CSA-C802.2, Minimum Efficiency Values for Dry Type Transformers.
- .2    National Electrical Manufacturers Association (NEMA)

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3                CLOSEOUT SUBMITTALS**

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

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements and with manufacturer's written instructions.
- .2    Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3    Storage and Handling Requirements:
  - .1    Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2    Store and protect dry type transformers from nicks, scratches, and blemishes.
  - .3    Replace defective or damaged materials with new.
- .4    Packaging Waste Management: remove for reuse by manufacturer and return of padding, pallets, crates, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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**Part 2 Products**

**2.1 DESIGN DESCRIPTION**

- .1 Design 1.
  - .1 Type: ANN.
  - .2 Single phase, 50 kVA, 600 V input, 120/240V output, 60 Hz.
  - .3 Voltage taps: standard.
  - .4 Insulation: Class 220, 150°C temperature Rise.
  - .5 Basic Impulse Level (BIL): standard.
  - .6 Hipot: standard.
  - .7 Average sound level: standard
  - .8 Impedance at 17 degrees C: standard
  - .9 Enclosure: NEMA 2, drip-proof, removable metal front panel.
  - .10 Mounting: floor.
  - .11 Finish: in accordance with Section 26 05 00 - Common Work Results for Electrical.
  - .12 Copper windings.
  - .13 Winding configuration to be as noted on drawings.
  - .14 Voltage Regulation to be 4% or better.

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Label size: 7.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Ensure adequate clearance around transformer for ventilation.

- .2 Install transformers in level upright position.
- .3 Remove shipping supports only after transformer is installed and just before putting into service.
- .4 Loosen isolation pad bolts until no compression is visible.
- .5 Make primary and secondary connections in accordance with wiring diagram.
- .6 Energize transformers after installation is complete.
- .7 Make conduit entry into bottom 1/3 of transformer enclosure.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.4 PROTECTION**

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

**END OF SECTION**

**Part 1            General**

**1.1                SECTION INCLUDES**

- .1    Subsoil materials.
- .2    Topsoil materials.
- .3    Execution.

**1.2                RELATED SECTIONS**

- .1    Subsurface Investigation Report: Geotechnical report; bore hole locations and findings of subsurface materials.
- .2    Section 01 35 43 – Environmental Procedures.
- .3    Section 31 05 16 - Aggregate Materials.
- .4    Section 31 23 33.01 – Excavation, Trenching and Backfilling.
- .5    Section 32 92 20 - Seeding.

**1.3                SUBMITTALS FOR INFORMATION**

- .1    Section 01 33 00: Submission procedures.
- .2    Materials Source: Submit name of imported materials source.

**1.4                CLOSEOUT SUBMITTALS**

- .1    Section 01 78 10: Submission procedures.

**Part 2            Products**

**2.1                SUBSOIL MATERIALS**

- .1    Subsoil:
  - .1    Excavated and re-used material.
  - .2    Graded.
  - .3    Free of lumps larger than 75 mm, rocks larger than 50 mm, and debris.

**2.2                TOPSOIL MATERIALS**

- .1    Topsoil:
  - .1    Excavated and reused material.
  - .2    Graded.
  - .3    Free of roots, rocks larger than 13 mm, subsoil, debris, large weeds and foreign matter.
  - .4    Conforming to ASTM D2487 Group Symbol OH.

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**2.3 SEED SALVAGE MATERIALS**

- .1 Seed Salvage:
  - .1 Excavated and reused material. Seed bank shall be the top 100m of the topsoil layer.
  - .2 Stockpiled in wind rows no more than 450mm deep.
  - .3 Graded.
  - .4 Departmental Representative to confirm slope stabilization materials to be used over winter.

**Part 3 Execution**

**3.1 SOIL REMOVAL**

- .1 Remove lumped soil, boulders, and rock.
- .2 Stockpile excavated material in area designated on site.
- .3 Remove excavated material from site.

**3.2 STOCKPILING**

- .1 Stockpile materials on site at locations designated by Consultant.
- .2 Stockpile in sufficient quantities to meet Project schedule and requirements.
- .3 Separate differing materials with dividers or stockpile apart to prevent mixing.
- .4 Prevent intermixing of soil types or contamination.
- .5 Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

**3.3 STOCKPILE CLEANUP**

- .1 Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.
- .2 Leave unused materials in a neat, compact stockpile.
- .3 If a borrow area is indicated, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

**3.4 HYDROSEEDING**

- .1 Hydroseed to not be used.

**END OF SECTION**



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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 33 00 - Submittal Procedures.
- .2    Section 32 11 16.01 - Granular Sub-Base.

**1.2                REFERENCES**

- .1    American Society for Testing and Materials (ASTM) - Most recent edition:
  - .1    ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
  - .2    ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .3    ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .4    ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .5    ASTM 127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
- .2    Government of Newfoundland and Labrador - Department of Transportation and Works:
  - .1    Government of Newfoundland and Labrador - Department of Transportation and Works Highway Design Division - Highways Specification Book (Latest Edition).
- .3    Newfoundland and Labrador - Department of Natural Resources:
  - .1    Quarry Rights Administration - Acts and Regulations.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Samples:
  - .1    Allow continual sampling by the Departmental Representative during production.
  - .2    Provide the Departmental Representative with access to source and processed material for sampling.
  - .3    Install sampling facilities at discharge end of production conveyor, to allow the Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by the Owner to permit full cross section sampling.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Granular Sub-Base:
  - .1 See Section 32 11 16.01 - Granular Sub-Base.
- .3 Class “B” Granular Backfill:
  - .1 Conform to Granular Sub-Base, Section 32 11 16.01 - Granular Sub-Base.
- .4 Bedding Material:
  - .1 Conform to Granular Sub-Base, Section 32 11 16.01 - Granular Sub-Base.
- .5 Approved Fill:
  - .1 Use of material subject to approval by Departmental Representative.
- .6 Rock Fill:
  - .1 Produced from quarry stone and of such sizes as may be approved or specified. All pieces of stone shall be sound and subject to approval.
  - .2 Physical Properties: Rock fill shall conform to the following physical properties:

Property	Test Method	Rock Fill
Absorption % max.	ASTM C 127	2.00
LA Abrasion % max	ASTM C 131	40

- .3 Construction Methods:
  - .1 Rock Fill shall be machine placed and compacted as directed by the Departmental Representative.
- .7 200 mm Minus Rock Fill:
  - .1 The stone must be crushed quarry stone and conform to the grading specified below:

Sieve Size, <i>µm</i>	Percent Passing by Weight
200,000	100
150,000	90 - 100
112,000	25 - 35
80,000	0- 20

Sieve Size, <i>µm</i>	Percent Passing by Weight
20,000	0 - 10

## 2.2 SOURCE QUALITY CONTROL

- .1 Inform the Departmental Representative of proposed source of aggregates and provide access for sampling at least two (2) weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise the Departmental Representative at least two (2) weeks minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.
- .5 Park quarries shall not be available for this project.

## Part 3 Execution

### 3.1 PREPARATION

- .1 Aggregate Source Preparation:
  - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as approved by authority having jurisdiction.
  - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
  - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
  - .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
  - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
  - .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
- .2 Processing:
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
  - .2 Blend aggregates, if required, including reclaimed materials that meet physical requirements of specification in order to satisfy gradation requirements for material and percentage of crushed particles, or particle shapes, as specified:

- .1 Use methods and equipment approved in writing by the Departmental Representative.
- .3 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.
- .4 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
- .3 Handling:
  - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .4 Stockpiling:
  - .1 Stockpile aggregates in sufficient quantities to meet project schedules.
  - .2 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .3 Stockpile aggregates on ground but do not incorporate bottom 200 mm of pile into Work.
  - .4 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the Departmental Representative within 48 hours of rejection.
  - .6 Do not cone piles or spill material over edges of piles.

### **3.2 CLEANING**

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 35 30 - Health and Safety Requirements.
- .2    Section 01 35 43 - Environmental Procedures.
- .3    Section 01 74 11 - Cleaning.
- .4    Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**1.2                REFERENCES**

- .1    Government of Newfoundland and Labrador - Department of Transportation and Works:
  - .1    Government of Newfoundland and Labrador - Department of Transportation and Works Highway Design Division - Highways Specification Book (Latest Edition) - Division 2 - Grading, Section 201 - Clearing and Grubbing.

**1.3                DEFINITIONS**

- .1    Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2    Grubbing consists of excavation and disposal of stumps and roots to not less than 200 mm below existing ground surface.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit manufacturer's installation instructions.

**1.5                QUALITY ASSURANCE**

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

**1.6                STORAGE AND PROTECTION**

- .1    Prevent damage to fencing, bench marks, underground utilities, water courses, and root systems of trees which are to remain.

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**Part 2 Products**

**2.1 MATERIALS**

- .1 Not Used.

**Part 3 Execution**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 All installation and maintenance of temporary erosion and sedimentation control shall be completed in accordance to the latest version of the Government of Newfoundland and Labrador - Department of Transportation and Works:
- .1 Government of Newfoundland and Labrador - Department of Transportation and Works Highway Design Division - Highways Specification Book (Latest Edition) - Division 8 - Environmental Requirements, Section 817 - Check Dam Sediment Trap and Section 01 35 43 - Environmental Procedures.
  - .2 Provide temporary erosion and sedimentation control measures (silt fencing and erosion control structures) to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - .3 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 PREPARATION**

- .1 Inspect site and verify with the Departmental Representative items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site:
- .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
  - .2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

**3.3 CLEARING**

- .1 Clearing includes felling, trimming and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush and rubbish occurring within cleared areas.
- .2 All clearing shall be hand cut.

- .3 Clear as directed by the Departmental Representative, by cutting at height of not more than 300 mm.
- .4 Timber materials less than 100 mm in diameter must be chipped and spread evenly as directed by the Department Representative.
- .5 The maximum chip size shall be no more than 300 mm long by 75 mm in thickness.
- .6 Timber greater than 100 mm in diameter must be cut to 1200 mm lengths, transported and stockpiled as directed by the Departmental Representative for future use by the Park.

### **3.4 GRUBBING**

- .1 Remove and dispose of roots larger than 75 mm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

### **3.5 REMOVAL AND DISPOSAL**

- .1 Remove grubbed materials outside the Park to a disposal area approved for such materials by applicable regulations.

### **3.6 FINISHED SURFACE**

- .1 Leave ground surface in condition suitable for stripping of topsoil to approval of the Departmental Representative.

### **3.7 CLEANING**

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

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 30 - Health and Safety Requirements.
- .3 Section 01 35 43 - Environmental Procedures.
- .4 Section 31 05 16 - Aggregate Materials.
- .5 Section 31 32 19.01 - Geotextiles.
- .6 Section 33 46 16 – Subdrainage Piping.

**1.2 MEASUREMENT PROCEDURES**

- .1 Measurement for payment will be rock excavation only.
- .2 Rock meeting the description stated under the definitions section shall be measured by volume of rock removed. Volume of rock removed shall be based on contractor surveys performed before and after of the rock excavation. Contractor must obtain approval of rock surface from Departmental Representative before completing surveys. Surveys and volumes to be review and approved by Departmental Representative. Contractor will only be paid for volume of rock removal required to complete the work. Rock removal shall meet applicable OH & S requirements.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM): latest edition:
  - .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian Standards Association (CSA International); latest edition:
  - .1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005):
    - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
  - .2 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
  - .3 Government of Newfoundland and Labrador - Department of Transportation and Works Highway Design Division - Highways Specification Book (Latest Edition).



- .3 Canadian Environmental Protection Act (Available on-line Government of Canada Website).
- .4 Newfoundland and Labrador Environmental Act and Regulations.
- .5 Government of Newfoundland and Labrador - Department of Transportation and Works:
  - .1 Government of Newfoundland and Labrador - Department of Transportation and Works Highway Design Division - Highways Specification Book (Latest Edition).
- .6 Occupational Health & Safety Act - Province of Newfoundland and Labrador.

#### 1.4 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation:
  - .1 Rock: solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature up to required depth, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Fill material: rock fill meeting the requirements specified in Section 31 05 16 - Aggregate Materials, maximum size 200 mm in any dimension.
- .6 Fill against structure: material supplied, placed and compacted adjacent to structures, as shown in Contract Documents. Material is crushed and screened gravel or rock meeting the requirements specified in Section 31 05 16 - Aggregate Materials.
- .7 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136.
    - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45
    - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

- .8 Backslope: the slope in a cut between the invert of the roadside ditch and the point where the slope intersects original ground.
- .9 Rock Face: the vertical or near vertical face between the top of the existing rock surface and the designated rock or ditch grade line.

## **1.5 QUALITY ASSURANCE**

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where the Consultant is employee of the Contractor, submit proof that Work by the Consultant is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least two (2) weeks prior to beginning Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified Professional Engineer registered or licensed in the Province of Newfoundland and Labrador.
- .5 Keep design and supporting data on site.
- .6 Engage services of a qualified Professional Engineer who is registered or licensed in the Province of Newfoundland and Labrador in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed and approved by the Departmental Representative.
- .8 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

## **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

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

## **1.7 EXISTING SITE CONDITIONS**

- .1 Contractor to visit site prior to submission of tender.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Class "B" Granular Backfill: properties to Section 31 05 16 - Aggregate Materials.
- .2 Bedding Material: properties to Section 31 05 16 - Aggregate Materials.
- .3 Geotextile: woven material with properties to 31 32 19.01 - Geotextiles.

- .4 Type 3 Fill: selected materials from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 25mm, cinders, ashes, sods, refuse or other deleterious materials.

### **Part 3 Execution**

#### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with the Newfoundland and Labrador Environment Act and Regulations, and in accordance with authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### **3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

#### **3.3 PREPARATION/PROTECTION**

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

#### **3.4 STOCKPILING**

- .1 Stockpile fill materials in areas designated by the Departmental Representative:
  - .1 Stockpile granular materials in manner to prevent segregation.
  - .2 Protect fill materials from contamination.
  - .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

#### **3.5 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.

- .2 Provide for the Departmental Representative's approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur:
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved collection areas and in a manner not detrimental to public and private property, or portion of Work completed or under construction:
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### 3.6 EXCAVATION

- .1 Advise the Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as directed by the Departmental Representative.
- .3 All surplus excavated material shall be stockpiled at locations as directed by the Departmental Representative.
- .4 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Departmental Representative.
- .5 Restrict vehicle operations directly adjacent to open trenches.
- .6 Dispose of surplus by stockpiling on site as directed by the Departmental Representative.
- .7 Do not obstruct flow of surface drainage or natural watercourses.
- .8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .9 Notify the Departmental Representative when bottom of excavation is reached.
- .10 Obtain the Departmental Representative's approval of completed excavation.
- .11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative.
- .12 Correct unauthorized over-excavation as follows:
  - .1 Fill over excavated space with approved fill compacted to not less than 100% of Standard Proctor maximum dry density.
  - .2 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .13 Hand trim, make firm and remove loose material and debris from excavations:

- .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .2 Clean out rock seams and fill with concrete mortar or grout to approval of the Representative.
- .14 Install geotextiles around pipe in accordance with Section 31 32 19.01 - Geotextiles.

### **3.7 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698:
  - .1 Under concrete slabs/foundations: provide 300mm compacted thickness Class "B" Granular Backfill to underside of slab. Compact to 100%.
  - .2 Adjacent to walls: use Class "B" Granular Backfill for minimum 300mm from wall and compact to 95% for remaining portion use Type 3 fill compacted to 95%.

### **3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services Section 33 41 00 – Storm Utility Drainage Piping as indicated.
- .2 Place bedding and surround material in unfrozen condition.

### **3.9 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 The Departmental Representative has inspected and approved installations.
  - .2 The Departmental Representative has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.2 m.
  - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

- .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from the Departmental Representative.
- .2 If approved by the Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by the Departmental Representative.
- .6 Place fill in areas as indicated.
- .7 Consolidate and level unshrinkable fill with internal vibrators.
- .8 Install drainage system in backfill as directed by the Departmental Representative.

**3.10 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Restore the site as close as possible to pre-construction condition focusing on re-vegetating sloped and cleared areas of the site with existing preserved sod mats, trees and shrubs and native plant/seed mix, trees and shrubs as directed by the Departmental Representative.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 33 00 - Submittal Procedures.
- .2    Section 01 74 11 - Cleaning.
- .3    Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .4    Section 33 46 16 – Subdrainage Piping.

**1.2                REFERENCES**

- .1    American Society for Testing and Materials International, (ASTM), most recent edition:
  - .1    ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .2    ASTM D 4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .3    ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
  - .4    ASTM D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
  - .5    ASTM D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
  - .6    ASTM D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
- .2    Canadian General Standards Board (CGSB), most recent edition:
  - .1    CAN/CSA-G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
  - .2    CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Submit product information of proposed product a minimum of 2 weeks prior to beginning work.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1    During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

**Part 2 Products**

**2.1 MATERIAL**

- .1 Physical properties as indicated in Table 1 - Requirements of woven geotextile materials.
- .2 Geotextile: woven synthetic fibre fabric, supplied in rolls:
  - .1 Width: 3.5 m minimum.
  - .2 Length: 79 m minimum.
  - .3 Composed of: minimum 85% by mass of polypropylene and/or polyester, with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 30 days.
- .3 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m<sup>2</sup> to CAN/CSA G164.
- .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

**Table 1- Requirements of Non-Woven and Woven Geotextiles**

Property	Unit	ASTM	Type of Fabric	
			N2	W2
Tearing Strength (Trapezoid Method)	N	D4533	250	500
Grab Tensile Strength (Both Directions)	N	D4632	600	1200
Elongation At Break	%	D4632	50	25 max.
Effective Opening Size	µm	D4751	50 to 250	300
UV Degradation at 500 HRS	% Ret.	D4355	N/A	50
Permittivity	sec <sup>-1</sup>	D4491	1.25 to 2.75	N/A
Permeability	cm/s	D4491	N/A	5*10-3

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Place geotextile material, at locations shown on drawings and directed by the Departmental Representative.
- .2 Overlap each successive strip of geotextile 500 mm over previously laid strip.
- .3 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .4 After installation, cover with overlying layer within 4 hours of placement.



- .5 Replace damaged or deteriorated geotextile to approval of the Departmental Representative.
- .6 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning:
  - .1 Leave Work area clean at end of each day.

**3.3 PROTECTION**

- .1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**

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**Part 1            General**

**1.1                DESCRIPTION**

- .1            This section specifies requirements for supplying, producing and placing crushed quarry stone as a granular subbase (Granular “B” Gravel) to lines, grades and typical cross sections indicated, or as directed by Departmental Representative.

**1.2                RELATED REQUIREMENTS**

- .1            Section 01 33 00 - Submittal Procedures.  
.2            Section 31 05 16 - Aggregate Materials.

**1.3                REFERENCES**

- .1            Government of Newfoundland and Labrador - Department of Transportation and Works:  
.1            Government of Newfoundland and Labrador - Department of Transportation and Works Highway Design Division - Highways Specification Book (Latest Edition) - Division 3 - Pavement, Selected Granular Base Course and Related Materials - Section 315 - Selected Granular Base Course - Granular “B”.  
.2            ASTM International - most recent edition:  
.1            ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.  
.2            ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.  
.3            ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.  
.4            ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.  
.5            ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).  
.6            ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.  
.3            Ministry of Transportation of Ontario:  
.1            LS-618 Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2            Products**

**2.1                MATERIALS**

- .1            Granular Sub-Base: to meet Granular “B” Gravel and the following requirements:

- .1 Granular sub-base to be quarried, crushed rock.
- .2 Gradations to be within limits as indicated for Granular "B" in Government of Newfoundland and Labrador - Department of Transportation and Works Highway Design Division - Highways Specification Book (Latest Edition) - Division 3 - Pavement, Selected Granular Base Course and Related Materials - Section 315 - Selected Granular Base Course.
- .3 Granular sub-base to be supplied by Contractor.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of subgrade are acceptable for Granular Sub-base installation in:
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of approval to proceed from Departmental Representative.

#### **3.2 PLACING**

- .1 Place Granular Sub-base after subgrade is inspected and approved by the Departmental Representative.
- .2 Construct Granular Sub-base to depth and grade in areas indicated on the plans or as directed by the Departmental Representative.
- .3 Ensure no frozen material is used in placing.
- .4 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.
- .5 Begin spreading sub-base material on crown line or high side of one-way slope.
- .6 Place Granular Sub-base materials using methods which do not lead to segregation or degradation.
- .7 Place material to full width in uniform layers not exceeding 200 mm compacted thickness. The Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
- .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .9 Remove and replace portion of layer in which material has become segregated during spreading.

#### **3.3 COMPACTION**

- .1 Compaction equipment to be capable of obtaining required material densities.

- .2 Compact to density of not less than 100% maximum dry density in accordance with ASTM D698.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .4 Apply water as necessary during compaction to obtain specified density. If aggregate is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Departmental Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### **3.4 CLEANING**

- .1 Leave work area clean at end of each day.

### **3.5 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 25 mm of elevation as indicated but not uniformly high or low.

### **3.6 PROTECTION**

- .1 Maintain finished Granular Sub-base in condition conforming to this section until succeeding base is constructed, or until Granular Sub-base is accepted by the Departmental Representative.

**END OF SECTION**

**Part 1            General**

**1.1                SECTION INCLUDES**

- .1    Seed Bank Salvage- Collection.
- .2    Preparation of subsoil.
- .3    Placing topsoil.
- .4    Seed Bank Salvage - Placement.
- .5    Seed Protection.
- .6    Maintenance.

**1.2                RELATED SECTIONS**

- .1    Section 31 05 13 - Soil Materials: Topsoil material.
- .2    Section 31 29 33.01 – Excavation, Trenching and Backfilling.

**1.3                DEFINITIONS**

- .1    Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

**1.4                CLOSEOUT SUBMITTALS**

- .1    Maintenance Contracts:
  - .1    Provide service and maintenance of seeded areas for three (3) months from Date of Substantial Completion.
  - .2    Maintain seeded areas immediately after placement until restoration area is well established and exhibits a vigorous growing condition.
- .2    Maintenance Data: Include maintenance instructions, watering amounts and frequency.

**1.5                QUALITY ASSURANCE**

- .1    Seed to be salvaged from existing onsite sources. Seed Bank salvage areas to be maintained throughout construction to ensure that the original source is weed free.

**1.6                REGULATORY REQUIREMENTS**

- .1    Comply with regulatory agencies for herbicide composition.
- .2    Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture from on-site seedbank source.

**1.7 DELIVERY, STORAGE, AND PROTECTION**

- .1 Seed bank salvage shall be completed onsite.
- .2 Salvaged seed shall be established in windrows onsite.
- .3 Windrows shall be protected from drying out and must be watered throughout construction.

**Part 2 Products**

**2.1 SEED SUPPLIERS**

- .1 Onsite sources seed bank salvage only.

**2.2 SEED MIXTURE**

- .1 To be taken from onsite seed bank salvage areas.

**2.3 SOIL MATERIALS**

- .1 Topsoil: As specified in Section 31 05 13.
- .2 Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.
- .3 Topsoil: Excavated from site and free of weeds.
- .4 Seed Bank Salvage: As specified in Section 31 05 13.
- .5 Seed Bank Salvage: Excavated from site and free of weeds.

**2.4 ACCESSORIES**

- .1 Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are acceptable.
- .2 Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- .3 Erosion Fabric: Jute matting, open weave.
- .4 Stakes: Softwood lumber, chisel pointed.
- .5 String: Inorganic fibre only.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verify existing conditions before starting work.
- .2 Verify that prepared soil base is ready to receive the work of this section.

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**3.2 SEED BANK SALVAGE - COLLECTION**

- .1 Salvage existing seed from top 100mm of topsoil.
- .2 Temporarily establish salvaged seed in windrows to promote and maintain growth during construction. Windrows not to exceed 450 mm in height
- .3 Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- .4 Maintain seed bank salvage health by watering as required until placement.

**3.3 PREPARATION OF SUBSOIL**

- .1 Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- .2 Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- .3 Scarify subsoil to a depth of 75 mm where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

**3.4 PLACING TOPSOIL**

- .1 Spread topsoil to a minimum depth of 150 mm over area to be seeded. Rake until smooth.
- .2 Place topsoil during dry weather and on dry unfrozen subgrade.
- .3 Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- .4 Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

**3.5 SEED BANK SALVAGE - PLACEMENT**

- .1 Apply seed bank salvage to a minimum depth of 50mm.
- .2 Do not seed areas in excess of that which can be mulched on same day.
- .3 Planting Season: April to September.
- .4 Do not seed immediately following rain or when ground is too dry.
- .5 Rolling may overly compact soil, specify with caution.
- .6 Roll seeded area with roller not exceeding 50 kg.
- .7 Apply water with a fine spray immediately after each area has been seeded. Saturate to 100 mm of soil.

**3.6 SEED PROTECTION**

- .1 Identify seeded areas with stakes and string around area periphery. Set string height to 300 mm. Space stakes at 900 mm. Place snow fence around areas as well.
- .2 Cover seeded slopes where grade is 1:3 or greater with erosion control matting Roll fabric onto slopes without stretching or pulling.

- .3 Lay fabric smoothly on surface, bury top end of each section in 150 mm deep excavated topsoil trench. Provide 300 mm overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- .4 Secure outside edges and overlaps at 900 mm intervals with wood stakes.
- .5 Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- .6 At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 150 mm.

### **3.7 MAINTENANCE**

- .1 Water to prevent seed bank salvage areas from drying out.
- .2 Neatly trim edges and hand clip where necessary.
- .3 Control growth of weeds during construction and 3 month warranty period. Use of herbicides is not permitted.
- .4 Immediately reseed areas which show bare spots.
- .5 Protect seeded areas with warning signs during maintenance period.

**END OF SECTION**



**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Materials and installation for constructing new outfall structures, precast and cast-in-place manholes and catch basins.

**1.2 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 03 20 00 - Concrete Reinforcement.
- .3 Section 03 30 00 - Cast-in-Place Concrete.
- .4 Section 31 05 16 - Aggregate Materials.
- .5 Section 31 23 33.01 - Excavation, Trenching and Backfilling.
- .6 Section 33 46 16 - Subdrainage Piping.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials (ASTM International).
  - .1 ASTM A48/A48M, Standard Specification for Gray Iron Castings.
  - .2 ASTM C139, Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
  - .3 ASTM C478M, Specification for Precast Reinforced Concrete Manhole Sections Metric.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International).
  - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
  - .2 CAN/CSA-G30.18-M92, Billet Steel Bars for Concrete Reinforcement.
  - .3 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

**1.4 SUBMITTALS**

- .1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.

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**1.5 SCHEDULING OF WORK**

- .1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Cast-in-place concrete: to Section 03 30 00 - Cast-in-Place Concrete.
- .2 Concrete reinforcement: to Section 03 30 00 - Concrete Reinforcement.
- .3 Precast manhole units: to ASTM C478M, circular or oval. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.
- .4 Precast catch basin sections: to ASTM C478M.
- .5 Joints: to be made watertight using rubber rings.
- .6 Mortar:
  - .1 Aggregate: to CSA A82.56.
  - .2 Cement: to CAN/CSA-A8.
- .7 Ladder rungs: to CAN/CSA-G30.18, No.25M billet steel deformed bars, hot dipped galvanized to CAN/CSA-G164. Rungs to be safety pattern (drop step type).
- .8 Adjusting rings: to ASTM C478M.
- .9 Concrete Brick: to CAN3-A165 Series.
- .10 Drop manhole pipe: to be same as sewer pipe.
- .11 Steel gratings, I-beams and fasteners: as indicated.
- .12 Frames, gratings, covers to dimensions as indicated and following requirements:
  - .1 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment.
  - .2 Gray iron castings: to ASTM A48/A48M, strength class 30B.
  - .3 Castings: coated with two applications of asphalt varnish or cleaned and ground to eliminate surface imperfections.

- .4 Manhole frames and covers: heavy duty municipal type for road service; Cover cast without perforations and complete with two 25 mm square lifting holes.
- .13 Granular bedding and backfill: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Crushed screed stone, gravel or sand.
  - .2 Granulations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1.
  - .3 TABLE

<b>Sieve Designation</b>	<b>% Passing Stone/Gravel</b>	<b>Gravel/Sand</b>
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	50-100
2.00 mm	-	30-90
0.425 mm	10-25	10-50
0.180 mm	-	-
0.075 mm	0-8	0-10

- .4 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

### **PART 3 EXECUTION**

#### **3.1 EXCAVATION AND BACKFILL**

- .1 Excavate and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and as indicated.
- .2 Obtain approval of Departmental Representative before installing, manholes or catch basins.

#### **3.2 CONCRETE WORK**

- .1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Position metal inserts in accordance with dimensions and details as indicated.

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### 3.3 INSTALLATION

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.
- .4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density.
- .5 Precast units:
  - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight with Departmental Representative approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination thereof.
  - .2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
  - .3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .6 Compact granular backfill to 95% corrected maximum dry density.
- .7 Place unshrinkable backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfill.
- .8 Set frame and cover to required elevation on no more than 4 courses of brick. Make brick joints and join brick to frame with cement mortar. Parge and make smooth and watertight.
- .9 Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.
- .10 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.
- .11 Install safety platforms in manholes having depth of 5 m or greater, as indicated.

### 3.4 LEAKAGE TEST

- .1 Install watertight plugs or seals on inlets and outlets of each new manhole and fill manhole with water. Leakage not to exceed 0.3% per hour of volume of manhole.
- .2 If permissible leakage is exceeded, correct defects. Repeat until approved by Departmental Representative.

- .3 Departmental Representative will issue Test Certificate for each manhole passing test.
- .4 Provide copy certification of leakage test acceptance to Departmental Representative.  
Include certification in Commissioning Manual.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

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

**1.2 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM C4, Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile.
  - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM C444M, Standard Specification for Perforated Concrete Pipe Metric.
  - .4 ASTM C654M, Standard Specification for Porous Concrete Pipe Metric.
  - .5 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>(600 kN-m/m<sup>3</sup>)).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 CSA International
  - .1 CAN/CSA-B1800, Thermoplastic Non-pressure Pipe Compendium.
  - .2 CAN/CSA-G401, Corrugated Steel Pipe Products.
- .4 U.S. Environmental Protection Agency (EPA) / Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes, pipe fittings, tiles, and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
  - .1 Submit manufacturer's certification that drain pipe materials meet requirements of this Section.
  - .2 Certification to be marked on pipe.
- .4 Test and Evaluation Reports:
  - .1 Submit manufacturer's test data that drain pipe materials meet requirements of this Section.

**1.4 DELIVERY, STORAGE AND HANDLING**

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

**Part 2 Products**

**2.1 MATERIALS**

- .1 Plastic pipe and fittings: to CAN/CSA B182.1 for 150mm and CAN/CSA B-182.2 for 200 mm sizes, nominal inside diameter as specified on the drawings.
- .2 Perforated plastic pipe and fittings: to CAN/CSA-B182.1. Nominal pipe sizes 150 mm.
- .3 Granular filter material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Screened stone or gravel.
  - .2 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.2.
- .4 Table:

Sieve Designation	% Passing
200 mm	-
75 mm	-
50 mm	-
38.1 mm	-
25 mm	-
19 mm	-
12.5 mm	100
9.5 mm	-
4.75 mm	70-100
2.00 mm	60- 95
0.425 mm	15- 40
0.180 mm	0- 10
0.075 mm	-

- .5 Geotextile: In accordance with Section 31 32 19.01 - Geotextiles.

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**Part 3 Execution**

**3.1 TRENCHING**

- .1 Do trenching, excavating and backfilling in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Place filter, bedding material after approval of excavation, trench by Departmental Representative.

**3.2 BEDDING**

- .1 Place filter/ bedding material as indicated and compact to minimum 95% of maximum density to ASTM D698.

**3.3 INSTALLATION OF PIPE SUB-DRAINS**

- .1 Lay pipe drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points.
  - .1 Ensure barrel of each pipe is in contact with bed throughout full length.
- .2 Begin laying at outlet and proceed in upstream direction.
- .3 Lay perforated pipes with perforations downwards.
- .4 Lay bell and spigot pipe with bell ends facing upstream.
  - .1 Do not mortar joints.
- .5 Make joints tight in accordance with manufacturer's instructions.
- .6 Make watertight connections to existing drains, new or existing manholes and catch basins where indicated or as directed by Departmental Representative.
- .7 Plug open upstream ends of pipes with watertight concrete, steel or wood bulkheads.
- .8 Surround pipe with bedding gravel and compact as directed by Departmental Representative.
- .9 Surround and cover drain with filter material in uniform 150 mm layers as indicated and compact to at least 95% maximum density to ASTM D698.
- .10 Wrap or sleeve perforated pipe with geotextile filter as indicated.
- .11 Backfill remainder of trench as indicated to Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .12 Do not place bedding surround and backfill materials in frozen condition.
- .13 Protect sub-drains against flotation during installation.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.



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

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

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

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3                QUALITY ASSURANCE**

- .1            Quality assurance submittals: submit following in accordance with Section 01 45 00 – Testing and Quality Control.
  - .1            Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
  - .2            Manufacturer's Instructions: for installation and special handling criteria, installation sequence, cleaning procedures and maintenance.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2            Delivery and Acceptance Requirements:
  - .1            Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3            Packaging Waste Management: remove for reuse by manufacturer and return of packaging materials padding crates pallets in accordance with Section 01 74 21 - Construction/DemolitionWaste Management and Disposal.

**Part 2            Products**

**2.1                PVC DUCTS AND FITTINGS**

- .1            Rigid PVC duct: Type DB2/ES2, with fabricated fittings, for direct burial expanded flange ends, Trade size as indicated.
- .2            Rigid PVC split ducts.
- .3            Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.
- .4            Rigid PVC 90 degrees, 45 degrees bends and 5 degrees angle couplings as required.

**2.2 SOLVENT WELD COMPOUND**

- .1 Solvent cement for PVC duct joints.

**2.3 CABLE PULLING EQUIPMENT**

- .1 6 mm stranded nylon pull ropetensile strength 5 kN.

**2.4 WARNING TAPE**

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

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSTALLATION**

- .1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.
- .2 Clean inside of ducts before laying.
- .3 Install plastic duct spacers and ensure full, even support every 1.5 m and smooth transition throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.
- .6 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.
  - .1 Pull stiff bristle brush through each duct.
- .7 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.
- .8 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.
- .9 Install markers as required.
- .10 Notify the Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

**3.3 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

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

**END OF SECTION**