

Public Works and Government Services Canada

ICAO House – Public Place Refection
999, boulevard Robert-Bourassa, Montréal
PWGSC no. : R.090297.150

Specifications
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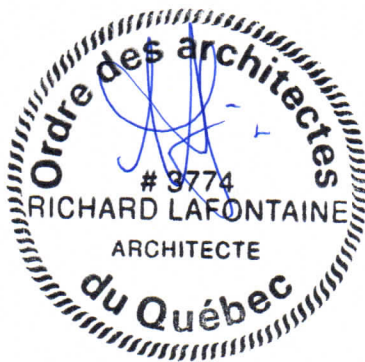


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END OF SECTION

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DIVISION 01

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 32 16.07-Construction Progress Schedule – Bar (Gantt Chart)

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises of the renovation of the Public Place ICAO House, located at 999 Robert-Bourassa boulevard in Montréal, as well as the replacement of the basilar stone, the installation of architectural lighting and a digital sign on the façade of the building.
 - .1 The work includes without limitation the provision and implementation of:
 - .2 Demolition and removal of concrete surfaces (lining and wall), turf, furniture elements, lighting components, trees and the lower part of the building's siding.
 - .3 The installation of an above and below ground drainage system to connect to the city of Montreal network;
 - .4 Safety measures composed of reinforced concrete cast in place with an architectural finish;
 - .5 Prefabricated concrete paving stone surfaces;
 - .6 Architectural lighting elements to be installed on the facade of the building and as well as in the public square;
 - .7 A digital sign to be attached to the facade of the building;
 - .8 Variety of horticultural plantings including continuous pits with integrated tree-grates and frames;
 - .9 A variety of urban furniture (flag poles, benches, waste baskets);
 - .10 The replacement of the basilar siding stone of the building.
 - .11 Relocating and restoring the work of art.

1.3 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work.
- .2 Co-ordinate use of premises under direction of Departmental Representative.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by the Departmental Representative.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.4 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage

1.5 WORK SEQUENCE

- .1 The work sequence must comply with the requirements of section 01 32 16.07- Construction Progress Schedule – Bar (Gantt Chart)
- .2 The Contractor must submit to the Departmental Representative, within seven days after contract award, a work sequence schedule showing the various stages of the work and the expected completion date.
- .3 According to the work sequence schedule and in a form acceptable to the Departmental Representative, provide within ten days after the contract award the dates of the submission of the shop drawings, the lists of materials and samples.
- .4 Each week, the contractor must update the work sequence schedule showing the level of progress, the resources used, and the performance achieved.

1.6 CONTAMINATED SOILS

- .1 Within the entire work area, the contractor is likely to encounter contaminated soils.
- .2 The contractor will have to manage contaminated soils in compliance with the requirements of section 01 35 13.43-Special procedures contaminated Sites of the current specification document.
- .3 The Contractor shall provide disposal slips at the end of each working day attesting that the contaminated soils have been sent to a MDDELCC-authorized facility for treatment or disposal.

1.7 WORKING HOURS

- 1. The Contractor must respect the working hours authorized by the applicable municipal regulations, namely Monday to Friday from 7am to 7pm and Saturdays from 7am to 5pm.

1.8 TRANSPORT ET CIRCULATION

- .1 In order to avoid inconvenience to residents and the public, the transport of materials and the flow of heavy vehicles must be carried out within the hours, areas and streets allowed by the Ville Marie Borough of the City of Montreal.
- .2 The protection and maintenance of public roads traffic must be carried out as described in section 01 55 26 – Traffic regulation.

1.9 WORK IMPLEMENTATION

1. The contractor must comply to the following procedure for the implementation of the works to be constructed:
 - .1 Implement the alignment, grades and points of reference for projected construction works in compliance with the geometry and the elevations indicated in the contract drawings.
 - .2 Conduct a joint inspection with the Departmental Representative to optimize the grading of the finished terrain so as to adapt it to existing conditions, while taking into account existing works.
 - .3 In the event of non-conformity of work implemented by the contractor, any resumption of works shall be redone at the contractor's expense.
 - .4 Georeferenced Autocad files will be made available to the contractor to prepare the implementation of construction works.

1.10 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to the occupants and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.11 EXISTING SERVICES

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .4 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services to maintain critical building and tenant systems.

1.12 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .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 specified.

Partie 2 Products

2.1 NOT USED

- .1 Not used.

Partie 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 11 00 – Summary of Work
- .2 Section 01 32 16.07 – Construction Progress Schedules – Bar Chart

1.2 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary access to and egress from work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.3 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Contractor will assign sanitary facilities for use by his personnel. Keep facilities clean.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to the normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.5 EXISTING SERVICES

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel, pedestrian, and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 55 26 – Traffic Control

1.6 SPECIAL REQUIREMENTS

- .1 Carry out noise generating in accordance with Section 01 35 43 – Environmental Procedures
- .2 Submit schedule in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart
- .3 Ensure Contractor s personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

- .4 Deliver materials outside of peak traffic hours, between 9:00 am to 15:00 pm unless otherwise approved by Departmental Representative. No delivery is allowed outside of working hours.

1.7 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted.

1.8 PERMITS AND CERTIFICATS

- 1. The contractor is responsible for obtaining all necessary certificate of authorization prior to the commencement of the work, including and without limitation:
 - .1 Required permit from the city of Montreal's Environmental Services (releases to the atmosphere and sewage discharges);
 - .2 Security Plan with the City of Montreal fire safety department
 - .3 Temporary occupancy permit in the public domain at the public works Division of the borough;
 - .4 Tree removal permit, with the City of Montreal.

1.9 USE OF THE PREMISES BY THE CONTRACTOR

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Where safety has been reduced because of work, provide for other temporary means to ensure the safety of the property and persons at the site, particularly for work along the sidewalk and boulevard Robert-Bourassa.
- .3 The contractor will set up sanitary facilities to be used by of his staff and the Departmental Representative. The contractor will have to maintain it. The location of the construction site trailer must be approved by the Departmental Representative.
- .4 The parking of the contractor's employees personal vehicles is prohibited on work site.
- .5 No storage space other than the designated area will be available. The Contractor shall find off-site additional work or storage areas necessary for the execution of the work under this agreement and pay the costs.
- .6 Maintain access for firefighting purposes.
- .7 Repair any damages to existing areas or surfaces after completion of Work and leave Work site in a state equivalent to or greater than the state it was prior to the start of construction work.

1.10 ACCESS TO REGULATED AREAS WITH ESCORT

- 1. Access to the building
 - .1 Work inside the building will take place only between 18:00 and 06:00.
 - .2 The contractor will have access only to the building from the receiving platform accessible from Viger Street.

- .3 Some of the contractor's activities require access to the building. Staff assigned to the present work must be accompanied by a security officer to be provided by the Government of Canada to access regulated areas.
 - .1 The regulated areas are: The receiving platform of the Viger access and the freight elevator, the facilities, the halls, the corridors, the stairwells inside the building, the lifting anchors on the roofs of the building.
- 2. Weekly schedule and Logistics
 - .1 The contractor will be required to file, on Wednesday of each week, a detailed schedule of its needs for the use and access of the regulated areas for the following week.
 - .2 It is the contractor's responsibility to coordinate access with the neighbor (MTQ) in the event that access to the receiving platform is to be blocked
 - .3 The freight elevator (elevator #1) of the building will be available for the access of workers, light tools and small materials. The contractor must submit to Departmental Representative a schedule for the use of the freight elevator for coordination and approval on the Wednesday of the week prior to the intended use. Changes to the schedule may be proposed within a notice period of 72 hours.
 - .4 The load capacity of the lift is 2041 kg and the dimensions are:
 - .1 Door: 1.20 m wide x 2.10 m high
 - .2 Interior: 1.60 m wide x 2.45 m deep x 3.60 m high
 - .5 Work to be done inside the building is allowed in the evenings and weekends, from Monday to Friday from 18:00 to 24:00 and on weekends on Saturdays from 7am to Sundays at 5pm.

1.11 ART WORK RESTAURATION

- .1 The scope of this contract includes specialized interventions with regards to the work of art by Marcelle Ferron. Work on dismantling, transporting, restoring, storing and reassembling must be carried out by the Quebec Conservation Centre (CCQ) under the Ministry of Culture and Communications of Quebec. An allowance is provided on the bid slip to cover the fees and the CCQ.
- .2 The Departmental Representative shall coordinate with the Contractor, following the award of the contract, the contact information of the curator responsible for this file of the state agency.
- .3 The services of the CCQ have been reserved to carry out the work of dismantling the artwork during the week of April 15 to 19. The contractor shall coordinate the reassembly periods of artwork with the CCQ. Allow a duration of 3 days for disassembly work.

Partie 2 Products

2.1 NOT USED

.1 Not Used.

Partie 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF THE ITEMS ON THE SLIP

.1 Building site organization:

This item will be paid as a lump-sum amount in accordance with the tender form for all costs incurred that are required to facilitate the execution of the work and the costs not forming part of other payable items on the tender form according to the requirements of the specification. The lump sum on the tender form must include the requirements of the sections of Division 01 and those that are not imputed directly or in the manner related to any of the different items on the tender form, but not limited to:

- .1 Site organization;
- .2 The coordination of site activities and building operations;
- .3 The signaling and setting up of any device and equipment required to ensure the safety of users such as traffic signs, signaling, parking reservations, etc.;
- .4 Permanent protection of existing equipment;
- .5 The contractor's obligations related to occupational health and safety;
- .6 The establishment of sanitary facilities for workers, where appropriate;
- .7 The maintenance of all entry points to the building for occupants and emergency vehicles;
- .8 The general cleaning of the construction site and all areas contaminated by the work;
- .9 Construction site fences, access points and truck waiting areas, the storage areas for construction materials, electricity, water and site lighting if necessary;
- .10 The contractor's required coordination with Departmental Representatives, the city of Montreal and other possible stakeholders including the obtention of all permits required for the completion of the work;
- .11 The maintenance of traffic flow and impact management for the full duration of the project including coordination with the city of Montreal and all requirements for the set-up and maintenance of detour signage and the management of vehicular, pedestrian and cyclist traffic and site access;
 - .1 The supply, installation, maintenance, upkeep, relocation and dismantling of all vehicle and bicycle traffic management equipment (visual cues, work panels, arrows of light signals, barriers, etc.) for all work contracted in accordance with the laws and standards in place and the requirements of all contract documents;
 - .2 The supply, installation, maintenance, relocation and dismantling of all additional traffic signs and devices necessary for the project according to the vehicular and cycling traffic maintenance plans and signage approved by the Departmental Representative;

- .3 The management of any existing traffic signs that conflict with temporary vehicular and cycling traffic signs (masking, unmasking of panels);
- .4 Expenses related to the existing traffic coordinator, the construction site manager, the signal crews and the signage maintenance teams;
- .5 The associated costs for special meetings related to traffic management;
- .6 The associated costs for any coordination with project adjacent construction sites that may hinder traffic flow.
- .7 All incidental expenses;
- .12 Environmental protection measures and the methods taken by Contractor to meet the laws, standards and requirements of environmental impact mitigation measures;

.2 Architectural element removal:

- .1 The removal of architectural elements will be paid as a lump-sum amount according to the tender form. The Contractor shall provide all material, tools, and labour needed to complete the work. The price on the tender form includes, but is not limited to:
 - 1. Removal of calcareous stones;
 - 2. Removal of the sill of the panel door treshold;
 - 3. Removal of prefabricated concrete panels;
 - 4. Removal of limestone supports;
 - 5. Removal of concrete masonry filler;
 - 6. Removal of membranous flashing;
 - 7. Removal of metal fasteners;
 - 8. Removal of extruded polystyrene insulation;
 - 9. Removing the outside ashtray.

.3 Electrical element removal:

- .1 Electrical element removal will be paid as a lump-sum amount according to the tender form. The Contractor shall provide all material, tools, and labour needed to complete the work. The price on the tender form includes, but is not limited to:
 - 1. Removal of light fixtures and projectors, conduits, wiring and boxes;
 - 2. Rehabilitation of surfaces and sealing of openings;
 - 3. Temporary measures to ensure the continuation of services during the work;
 - 4. Update of electrical distribution panel schedules;
 - 5. Materials disposal;

.4 Demolition of site elements :

- .1 The demolition of site elements will be paid as a lump-sum amount according to the tender form. The Contractor will provide all material, tools, and labour

needed to complete the work. The price submitted must include the excavation or dismantling of materials and accessories, loading, transporting, disposing and, if necessary, filling for the installation of new structures. The price on the tender form includes, but is not limited to:

1. Removal of concrete edges;
2. Removal of concrete walls;
3. Removal of concrete blocks;
4. Removal of concrete clumps;
5. Removal of concrete slabs with apparent aggregates;
6. Removal of billboards and their return to the client;
7. Removal of concrete billboard bases;
8. Removal of bollards and concrete bases;
9. Removal of concrete steps and staircase;
10. Removal of the concrete wall and planter;
11. Removal of flagpoles and concrete bases;
12. Removal of concrete anchors from the art installation;
13. Removal of prefabricated concrete bins;
14. The falling, clearing and off-site disposal of trees;
15. Drains;
16. Sumps.

.5 Excavation, loading, transportation and disposal of soils, including soils in the <B contamination range

- .1 Work includes costs related to excavation, loading for off-site transportation, transportation and disposal of soils <B at treatment or disposal sites authorized by the MELCC. The unit rate is in \$ / metric ton. This item is paid on the basis of soil removed on presentation of vouchers (transport voucher / weighing) in metric ton. This work includes all types of excavation work to be carried out in the project.
- .2 The contractor shall carry out excavations respecting the theoretical excavation lines indicated in the plans, standards of the CNESST and BNQ 1809-300. Any excavation beyond the theoretical trench lines will be at the expense of the Contractor.

.6 Segregation, temporary storage, loading, transport and disposal of residual materials

- .1 The work includes the costs associated with the excavation of residual materials (metal, concrete, asphalt or other non-recoverable residual materials), segregation of residual materials by type, temporary stacking, loading, transport and disposal of residual materials in a site authorized by the MDDELCC. The unit rate is in \$ metric ton. This amount is paid on the basis of residual materials recycled or disposed of based on the presentation of a ticket (transport/weight) in metric tons. This procedure includes all the types of work to be done in the project.

.7 Backfilling:

- .1 The backfilling work will be paid per metric ton as indicated on the bid form. The Contractor shall supervise the work and provide all labor, equipment, tools, materials, compaction, transportation to perform all the work described and specified in the plans and specifications including, but not limited to: backfilling with approved granular materials and compaction to fill the facilities of all types of backfilling included in the scope of this project. This item is paid in \$ / metric ton on presentation of vouchers (transport voucher / weighing).

.8 Foundation for paving

- .1 Paving foundation work will be paid at a lump sum as per the bid form. The Contractor must provide all equipment, tools, materials and labor required for the complete performance of the work. The price list includes, without limitation:
 1. Preparation and layout of the pavement infrastructure.
 2. Installation of geotextile as specified in this specification.
 3. Installation of rigid styrofoam insulation.
 4. Supply and installation of backfill without shrinkage.
 5. Supply and installation of sub-foundations in modified MG-112 granular materials.
 6. Supply and installation of crushed stone top foundation type MG-20.
 7. Evacuation and off-site transportation of unused materials.
 8. Excavation and backfilling work are remunerated separately at the items provided for this purpose on the bid form.

.9 Precast concrete pavers

- .1 Prefabricated concrete pavers will be paid for in a lump sum amount as indicated on the tender form. The Contractor will provide all material, tools, and labour necessary for the completion of the work. The price on the tender form includes, but is not limited to:
 1. A surface of prefabricated concrete pavers of format 600 mm x 600 mm, 300 mm x 600 mm and 300 x 300 mm, ground finish, granite grey colour;
 2. Prefabricated concrete paver inserts 300 mm x 600 mm, garnet finish, granite grey colour;
 3. Bedding sand layer;
 4. Sand for polymer stabilized joints;
 5. Cutting work;
 6. Removal and transport of unused materials to an off-site location.

.10 Removal and reinstallation of existing prefabricated concrete pavers

- .1 The removal and reinstallation of existing prefabricated concrete pavers will be paid for in a lump sum amount as indicated on the tender form. The Contractor

will provide all material, tools, and labour necessary for the completion of the work. The price on the tender form includes, but is not limited to:

1. Removal, storage and reinstallation of prefabricated concrete paving stones;
2. Supply of similar concrete pavers if damaged during work;
3. Bedding sand layer;
4. Sand for polymer stabilized joints;
5. Cutting work;
6. Removal and transport of unused materials to an off-site location.

.11 Urban furniture

.1 Urban furniture installation work will be paid for in a lump sum amount as indicated on the tender form. The Contractor will provide all material, tools, and labour necessary for the completion of the work. The price on the tender form includes, but is not limited to:

1. A Corten steel decorative block measuring 600 mm x 600 mm x 300 mm (block A);
2. A Corten steel decorative block measuring 600 mm x 600 mm x 600 mm (block B);
3. A decorative Corten steel illuminated cube measuring in 600 mm x 600 mm x 600 mm (block E);
4. Furniture block in Corten steel and wood 1800 mm x 600 mm x 450 mm (Type D);
5. Waste basket;
6. Tree frames and grates;
7. Flagpoles and concrete bases;
8. Transportation;
9. Installation;
10. Anchors;
11. Shop drawings;
12. Removal and transport of unused materials to an off-site location.

.12 Artwork restauration

.1 This article provides for an allowable amount. The Contractor will retain the restoration services of the Centre de Conservation du Québec (CCQ) under the Quebec Ministry of Culture according to the restoration practices that have been adopted by the Government of Canada. The work will be paid upon presentation of the CCQ's supporting documents without any increase or possible profits for the contractor. This allowance includes, but is not limited to:

1. The professional fees of the restorers for the coordination of this mandate;

2. Dismantling, packaging, transporting, restoring and reinstalling the art installation.

.13 Anchor base for the artwork

- .1 Anchor base work for the artwork will be paid for in a lump sum amount as indicated on the tender form. The Contractor will provide all material, tools, and labour necessary for the completion of the work. The price on the tender form includes, but is not limited to:
 1. The supply and installation of insulation under the base;
 2. Concrete formwork;
 3. The supply and laying of concrete;
 4. The supply and installation of frames;
 5. The supply and laying of the grout under the base plates of the new steel supports;
 6. The supply and installation of anchors for the steel frame brackets;
 7. The supply and installation of “HSS” steel supports, including their base plate and assemblies to existing structures;
 8. The provision and fixing of new anchors between the existing supports of the art installation and the new supports;
 9. The installation of the art installation with its supports, on the new base;
 10. The provision of shop drawings as specified in the specifications;

.14 Cast in place concrete safety features

- .1 The work for the cast in-place concrete safety features will be paid for in a lump sum amount as indicated on the tender form. The Contractor will provide all material, tools, and labour necessary for the completion of the work. The price on the tender form includes, but is not limited to:
 1. The setting up of temporary support measures for existing works in the surrounding area;
 2. The provision and installation of insulation under the bases (where required);
 3. Concrete formwork;
 4. The supply and laying of concrete;
 5. The supply and installation of frames;
 6. The finishing work of the non-soil portions for the concrete safety features.
 7. The provision of shop drawings as specified in the specifications.

.15 Safety features and devices

- .1 The work for the security features will be paid for in a lump sum amount as indicated on the tender form. The Contractor will provide all material, tools, and

labour necessary for the completion of the work. The price on the tender form includes, but is not limited to:

1. Retractable bollards;
2. Bollard control unit;
3. Control box (buttons);
4. Leads, cables, conduits, accessories, hardware, power and control circuits, circuit breakers, transformer, switches, draw boxes and modifications to the existing electrical distribution;
5. Leads, cables, conduits, brackets, profiles, fasteners, anchorages, piercings, bases and spacers accessories, hardware, power circuits, circuit breakers and modifications to the existing electrical distribution;
6. The removal and reinstallation of ceiling tiles, the opening and closing of gypsum ceilings and the repair of surfaces;
7. Conduits, fittings, wiring control;
8. Piercings and sealing of openings;
9. The removal and reinstallation of ceiling tiles, the opening and closing of gypsum ceilings and the repair of surfaces;
10. profiles, brackets and hardware;
11. Excavation and backfill, drilling and sealing of openings;
12. Excavation and backfill, drilling, connectors and sealing of openings;
13. Measuring the dimensions of the building to determine the optimum path for the passage of the conduits and drivers and the installation of the equipment;
14. Commissioning;
15. Ducts, drainage fittings;
16. Configuration and programming;
17. Certification of the bollards;
18. Manufacturer inspections and assistance;
19. Tests and adjustments;
20. Transportation;
21. Installation;
22. Anchors;
23. Removal and transport of unused materials to an off-site location;
24. Training, commissioning and operating procedure;
25. Warranty;
26. Shop drawings.

- .1 Architectural work will be paid for in a lump sum amount as indicated on the tender form. The Contractor will provide all material, tools, and labour necessary for the completion of the work. The price on the tender form includes, but is not limited to:
1. Installation of new granite siding;
 2. Installation of existing limestone siding at the same location;
 3. Installations of new limestone stones;
 4. Installations of prefabricated concrete elements existing in the same location;
 5. Installation of new masonry in concrete blocks;
 6. Installations of mechanical masonry fasteners;
 7. Installation of membranous flashing;
 8. Installation of self-adhesive sealing membrane;
 9. Installations of masonry joints;
 10. Installations of joints sealants;
 11. Installation of a rigid insulating panel;
 12. Installation of prefabricated drainage panels.

.17 Stormwater Sewers:

- .1 The installation of the retention pipes and the storm sewer pipes will be paid at the flat rate amount as in the bid form. The Contractor shall provide supervision of the work and provide all the labor, equipment, tools, materials, transportation and other services necessary to complete and complete all work described and specified in the plans and in Contract documents, including, but not limited to: supply and installation of piping, connection to manholes and projected pipelines, fittings and accessories, construction of joints, connections with existing manholes, trench maintenance, water exhaustion in excavations, laying and embedding of pipes, required tests, cleaning and TV inspection of pipes, shop drawings, etc.
- .2 Excavation and backfilling work are remunerated separately from the items provided for this purpose on the bid form.

.18 Trench drains (Channel)

- .1 Trench drains installation work will be paid at the flat rate amount as per the bid form. The Contractor shall supply and install the prefabricated polymer concrete gutter, including the trench drain, catch basins, angle iron, stainless steel grilles, grid fasteners, weathertight gaskets, trench drains, foundation and reinforced concrete foundation poured into place, cleaning, embedding at the perimeter of the gutter with crushed stone, shop drawings as well as all other elements required by this specification.
- .2 Excavation and backfilling work are remunerated separately at the items provided for this purpose on the bid form.

.19 Manholes

- .1 The installation works of the regulation chamber 2150X1750 mm and the circular manhole 2100Ø mm will be paid in the lump sum as per the bid form. The Contractor shall provide supervision of the work and provide all the labor, equipment, tools, materials, transportation and other services necessary to complete all work described and specified in the plans and in Contract documents, including, but not limited to, the supply and installation of the regulation chamber, the circular manhole, the vortex flow regulator, the check valves with rubber flaps, fittings and accessories, joint construction, connections with the projected pipes, trench maintenance, water exhaustion in the excavations, granular material bed and fill, required tests, shop drawings cleaning and the production of half benches at the base of the manholes in the factory or on site, etc.
- .2 .2 Excavation and backfilling work is remunerated separately at the items provided for this purpose on the bid form.

.20 Planting

- .1 Planting work will be paid for in a lump sum amount as indicated on the tender form. The Contractor will provide all material, tools, and labour necessary for the completion of the work. The price on the tender form includes, but is not limited to:
 1. Soil
 2. Maintenance work and warranty for one year;
 3. The planting of deciduous trees;
 4. Installation of continuous planting pit system for trees;
 5. Perennials planting;
 6. Removal and transport of unused materials to an off-site location;

.21 Relocation of existing trees off-site

- .1 The relocation of existing trees to an off-site location will be paid at the unit price provided in the tender form. The Contractor will provide all material, tools, and labour necessary for the completion of the work.

.22 Site lighting

- .1 The lighting of the site is paid to the lump sum such as the bid slip. The Contractor shall provide all material, tools, materials and manpower necessary for the complete completion of the work. The price on the slip includes, in a non-exhaustive manner:
 1. Lighting fixtures, cables, connectors, draw boxes;
 2. Brackets, fasteners, anchors, piercings;
 3. The conductors, cables, conduits, accessories, hardware, power circuits, circuit breakers, switches and modifications to the existing electrical distribution;
 4. The removal and reinstallation of ceiling tiles, the opening and closing of gypsum ceilings and the repair of surfaces;

5. profiles, brackets and hardware;
6. Lighting control including all equipment, power and control wiring, conduits, the painting of the conduits and accessories in factory, the hardware and accessories;
7. Excavation and backfill, drilling and sealing and fire proofing of openings and inspection of the structure;
8. A survey of the installations and the determination of the passages of ducts to minimize the repair of the surfaces;
9. Shop drawings.
10. Training, commissioning and operation procedures

.23 Architectural lighting

- .1 Architectural lighting fixtures are paid at the lump sum amount as in the bid slip. The Contractor shall provide all material, tools, materials and manpower necessary for the complete completion of the work. The price on the slip includes, in a non-exhaustive manner:

1. Lighting fixtures, cables, power and control boxes;
2. Brackets, fasteners, anchors, piercings, bases and spacers;
3. The conductors, cables, conduits, accessories, hardware, power circuits, circuit breakers, switches and modifications to the existing electrical distribution;
4. The removal and reinstallation of ceiling tiles, the opening and closing of gypsum ceilings and the repair of surfaces;
5. Concrete slabs, profiles, brackets and hardware;
6. Lighting control including all equipment, power and control wiring, conduits, the painting of the conduits and accessories in factory, the hardware and accessories;
7. Drilling, sealing and fire proofing of openings and inspection of the structure;
8. A survey of the installations and the determination of the passages of ducts to minimize the repair of the surfaces;
9. The grounding of flagpoles;
10. Shop drawings.
11. Training, commissioning and operation procedures.

.24 Power supply of bollards

- .1 The power supply of bollards is paid at the lump sum amount as in the bid slip. The Contractor shall provide all material, tools, materials and manpower necessary for the complete completion of the work. The price on the slip includes, in a non-exhaustive manner:

- .1 Brackets, fasteners, anchors, piercings;

- .2 Drivers, cables, conduits, accessories, hardware, power circuits, circuit breakers, Transformer, switches, draw boxes and modifications to the existing electrical distribution;
- .3 The removal and reinstallation of ceiling tiles, the opening and closing of gypsum ceilings and the repair of surfaces;
- .4 profiles, framing, brackets and hardware;
- .5 Excavation and backfill, drilling, sealing and fire proofing of openings and inspection of the structure;
- .6 Carry out the readings of the building and determine the optimum path for the passage of conduits and conductors;
- .7 Architectural work;
- .8 The supply and installation of all structural support elements of steels identified with structural drawings;
- .9 The provision and installation of temporary support measures, adjustment shims and upgrading elements for steel framing elements;
- .10 A survey of the installations and the determination of the passages of ducts to minimize the repair of the surfaces.
- .11 Shop drawings
- .12 Training, commissioning and operation procedures.

.25 Digital panel

- .1 The digital panel is paid at the lump sum amount as in the bid slip. This item is optional when awarding the contract. The Contractor shall provide all material, tools, materials and manpower necessary for the complete completion of the work. The price on the slip includes, in a non-exhaustive manner:
 1. The digital panel, cables, connectors, draw boxes;
 2. Brackets, fasteners, anchors, piercings;
 3. Drivers, cables, conduits, accessories, hardware, power circuits, circuit breakers, Transformer, switches, draw boxes and modifications to the existing electrical distribution;
 4. The removal and reinstallation of ceiling tiles, the opening and closing of gypsum ceilings and the repair of surfaces;
 5. profiles, framing, brackets and hardware;
 6. Control computer, cabinet, power and control wiring, conduits including all equipment, conduits, the painting of the conduits and accessories in factory, the hardware and accessories;
 7. Excavation and backfill, drilling, sealing and fire proofing of openings and inspection of the structure;
 8. Carry out the readings of the building and determine the optimum path for the passage of conduits and conductors;
 9. Architectural work;
 10. The supply and installation of all structural support elements of steels identified with structural drawings;

11. The provision and installation of temporary support measures, adjustment shims and upgrading elements for steel framing elements;
12. The provision of workshop drawings as specified in the quotation;
13. A survey of the installations and the determination of the passages of ducts to minimize the repair of the surfaces.
14. Shop drawings
15. Training, commissioning and operation procedures

END OF SECTION

Partie 1 General

1.1 MEASUREMENT FOR PAYMENT

- .1 No measurement for payment will be made under this section – Include item costs when required.

1.2 APPOINTMENT AND PAYMENT

- .1 Departmental Representative will appoint, and will pay for services of testing laboratory except follows:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.
 - .6 Additional tests specified as follows:
 - 1. Gradation of granularity
 - 2. Granular compaction of pavement infrastructure
 - 3. Granular compaction of the services trench
 - 4. Concrete resistance
 - 5. Air content and concrete sag
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.
- .3 The Departmental Representative must conduct random tests for quality control. The Departmental Representative will designate the testing laboratory and pay for the costs related specifically to quality.

1.3 CONTRACTORS RESPONSIBILITIES

- .1 Provide labour, equipment and facilities to:
 - .1 Provide access to Work for inspection and testing.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory s exclusive use to store equipment and cure test samples.
- .2 Notify Departmental Representative 48 hours minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

Partie 2 Products

2.1 NOT USED

- .1 Not Used.

Partie 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 32 16.19 – Construction Progress Schedule – Critical Path Method (CPM)
- .2 Section 01 33 00 – Submittal procedures
- .3 Section 01 56 00 – Temporary Barriers and Enclosures
- .4 Section 01 78 00 – Closeout submittals

1.2 ADMINISTRATIVE

- .1 The Departmental Representative shall schedule and administer project meetings throughout the progress of the.
- .2 The Departmental Representative shall prepare agenda for meetings.
- .3 The Departmental Representative shall convene written notice of each meeting five (5) days before the scheduled date.
- .4 Site meetings will be held at the PWGSC office, located at Place Bonaventure.
- .5 The Departmental Representative shall preside at meetings.
- .6 The Departmental Representative shall record the meeting minutes. He will include significant proceedings and decisions, and will identify actions by parties.
- .7 The Departmental Representative shall reproduce and distribute copies of minutes within three (3) days after meetings and transmit to meeting participants affected parties not in attendance.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.3 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 The Departmental Representative, the Contractor, the major Subcontractors, field inspectors and supervisors must be in attendance.
- .3 The Departmental Representative shall establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .4 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart.
 - .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 52 00 - Construction Facilities].
- .5 Delivery schedule of specified equipment in accordance with Section
- .6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .8 Owner provided products.
- .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 78 00 - Closeout Submittals.
- .12 Administrative procedures, photographs, hold backs.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.

1.4 PROGRESS MEETINGS

- .1 The Departmental representative shall establish a calendar of meetings to be held every two (2) weeks during the course of the work and one week prior to the completion of the works, unless there is agreement between the Department's representative and the contractor.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 The Departmental representative shall notify parties at least five (5) days prior to meeting.
- .4 The Departmental representative shall record minutes of meetings and circulate to attending parties and affected parties not in attendance within
- .5 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

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Not used.

1.2 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.3 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 14 working days after the contract has been awarded, a bar chart (Gantt Chart) which will be used as the overall plan and shall be utilized for the planning and follow-up of the work, as well as for the production of progress reports.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.
- .4 The timetable must be completed with MS Project 2013. Submit to the Departmental Representative an electronic copy of the source file and PDF for the reference calendar as well as each revised delivery schedule.
- .5 The Project Schedule.
 - .1 The Contractor must submit at the beginning of the project a Project Schedule that will serve as a reference calendar for the project follow-up as well as to set deadlines, if any.
 - .2 This implementation schedule must comply fully with the features listed by the Departmental Representative. The Departmental Representative will issue a notice of compliance, otherwise the Contractor must provide a detailed list of corrections.
 - .3 Once the notice of compliance is issued, the Project Schedule will be considered as the reference Project Schedule.
 - .4 The tasks present in the schedule must be detailed and grouped in a structured fashion. Minimally, this structure should include the following groups:
 - .1 Project management (Administration, mobilization, licensing, Approval of plans and methods, demobilization).
 - .2 Procurement (grant of sub-contracts, preparation of Shop Drawings, samples, examination and approval of drawings, manufacture and delivery).
 - .3 Construction (by activity, scheduling, duration, intervener, approval and monitoring period).
 - .4 The changes to the Reference Project Schedule.
 - .5 The Contractor must submit at all site meetings an updated timetable by indicating the date at which unforeseeable conditions or changes requested by the Departmental Representative or any other Reasons for changing the reference calendar have occurred. All the Changes to the schedule must be justified and endorsed by the Departmental Representative.

1.5 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule.
 - .1 Upon receipt of the notice of award of the contract, the contractor is required to start the administrative process and to grant the subcontractors and the orders that are attached to the project
 - .2 The substantial completion of the work shall be delivered no later than 30 August 2019.
 - .3 The final work completion certificate shall be delivered no later than 30 October 2019.
 - .4 The site will not be available to the contractor between September 16 and October 11, 2019, inclusively.
 - .5 La période à la disponibilité de l'entrepreneur disponible pour assurer l'ensemble de l'exécution des travaux jusqu'à l'achèvement substantiel est évaluée à 154 jours calendrier.

1.6 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within (5) working days.
- .3 Revise impractical schedule and resubmit within (5) working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.7 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Relocating the work of art.
 - .6 Excavation and backfill of the granular foundations.
 - .7 Concrete formwork and casting.
 - .8 Drainage and connection to the network.
 - .9 Lining of the lower siding of the building.
 - .10 Laying of concrete paving stone.
 - .11 Lighting.
 - .12 Electricity.
 - .13 Installing the electrical panel.

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- .14 Commissioning the facilities.
- .15 Plantings.
- .16 Supplies with a long delivery time.
- .17 Furniture Installation.
- .18 Cleaning.
- .19 Provisional Certification of Completion.
- .20 Corrections of deficiencies and final approval.

1.8 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule one (1) time every two (2) weeks, basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.9 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

Partie 2 Products

2.1 NOT USED

- .1 Not used.

Partie 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 013119 - Project meetings
- .2 Section 013216.07 - Construction progress schedule – Bar (GANTT) chart
- .3 Section 013519.06 – Health and Safety requirements
- .4 Section 013543 – Environnemental procedures
- .5 Section 015600 – Temporary barriers and enclosures
- .6 Section 017800 – Clouseout submittals

1.2 REFERENCE STANDARDS

- .1

1.3 ADMINISTRATIVE

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

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term shop drawings means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Canada, in the province of Quebec.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow to the Departmental Representative ten (10) days review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in two (2) duplicates, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor s name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor s stamp, signed by Contractor s authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.

- .3 Setting or erection details.
- .4 Capacities.
- .5 Performance characteristics.
- .6 Standards.
- .7 Operating weight.
- .8 Wiring diagrams.
- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 If no workshop drawing is required due to the use of a standard manufacturing product, submit one (1) electronic copy of the manufacturer's technical data sheets or documentation prescribed in the technical sections of the quotation and required by the Departmental representative.
 - .1 Submit one (1) electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .2 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .3 Testing must have been within 3 years of date of contract award for project.
- .12 Submit one (1) electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer s letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must bear a date after the award of the contract and indicate the designation of the project.
- .13 Submit one (1) electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - 1. Pre-printed documents describing the method of installation of products, materials and systems, including special notices and MSDSS indicating the impedances, risks and safety measures to be implemented.
- .14 Submit one (1) electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .15 Reports of the tests and checks carried out by the manufacturer's representative in order to confirm the conformity of the products, materials, equipment or systems installed in the manufacturer's instructions.
- .16 Submit one (1) electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .20 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.5 SAMPLES

- .1 Submit for review samples in two (2) duplicates as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's office.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 MOCK-UPS

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

Part 2	Products
2.1	NOT USED
.1	Not Used.

Part 3	Execution
3.1	NOT USED
.1	Not Used.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

1. All sections of Divisions 01 – General requirements and 02 – Existing Conditions
2. Section 31 23 33– Excavating, Digging and Backfilling.

1.2 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-51M-[81], Polyethylene Sheet for Use in Building Construction.
- .2 Canadian Council of Ministers of the Environment (CCME) Documentation
- .3 Government of Quebec, MDDELCC
 - .1 Environmental Quality Act (RSQ, C. Q-2)
 - .2 Regulation respecting the burial of contaminated soils (C. Q-2, r.18)
 - .3 Regulation respecting contaminated soil storage and contaminated soil transfer stations (C. Q-2, r.46)
 - .4 Québec's Soil Protection and Rehabilitation of Contaminated Sites Policy MDDELCC, 2016
 - .5 Soil Protection and Contaminated Sites Rehabilitation Policy — Action Plan 2017-2021, MDDELCC, 2017
 - .6 Management of dismantling materials-Guide to good practice (MDDELCC)
 - .7 Guide on the Reclamation of Non-Hazardous Inorganic Industrial Wastes as Construction Materials, (MDDELCC)
 - .8 Workplace Hazardous Materials Identification Systems (WHMIS)
 - .9 Applicable bylaw regulating sewer releases

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit, within a period of at least one week prior to the commencement of work, a management plan for the temporary excavated material disposal area. The plan must be presented to the Departmental Representative for approval.
- .3 Submit, within a period of at least one week prior to the commencement of work, an off-site management plan for the excavated material. The plan must be presented for approval to the Departmental Representative. Prepare the minutes of these meetings and transmit them to the participants and to the absentees concerned within five 5 days following each meeting.
- .4 Documents to be submitted for the Work-progress meetings: Submit the following documents at least 24 hours before each bi-weekly meeting:

- .1 Survey of the volumes of excavated soils stored in the temporary designated area.
- .2 Copies of the results of the air quality tests.
- .3 Copies of the transport manifests, and weighing notes produced by the organization which is in charge of the off-site disposal of the excavated materials.
- .4 Weekly records of those who have had access to the site and work area, including information on the access of workers and visitors.
- .5 All information required by the Departmental Representative or that can be attached to the agenda of the next work progress meeting.

1.4 NATURE OF THE WORK

1. Geotechnical drilling shows the presence of non-recoverable residual material. The Contractor will have to segregate the required materials in order to ensure its removal in compliance with criteria less than B. The selected dump site aimed to receive materials chosen by the contractor will determine the percentage of non-recoverable materials to be segregated prior to proceeding with removal.

1.5 REQUIREMENTS OF REGULATORY BODIES

- .1 Instore measures to prevent erosion and the transport of sediments.
- .2 Disposal of waste, debris and scrap materials must be done in compliance with federal, provincial and local pollution laws, ordinances, codes and regulations.
- .3 The work must meet and exceed the minimum requirements of applicable federal and provincial laws and regulations.
 1. The Contractor must ensure that the changes to the laws and regulations are followed once they are implemented.
- .4 If the requirements of the regulators exceed the scope of the work or conflict with specific contractual requirements, immediately notify the Departmental Representative.
- .5 The contractor is responsible for obtaining the required authorizations under applicable federal and provincial laws and regulations.
- .6 Trucks must comply with the requirements of Transportation of Dangerous Substances Regulation.

1.6 SEQUENCING AND SCHEDULING

Do not commence Work involving contact with potentially contaminated materials until decontamination facilities are operational and approved by Departmental Representative.

1.7 EROSION AND SEDIMENT CONTROL

- .1 Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas. Prevent erosion and sedimentation.
- .2 Minimize amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical. Strip vegetation, regrade, or otherwise develop to minimize erosion. Remove

accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and water courses, and repair damage caused by soil erosion and sedimentation as directed by Departmental Representative.

1.8 REMOVAL AND DISPOSAL

- .1 Dispose of off-site of all equipment and materials stored in accordance with the off-site waste management plan approved by the Departmental Representative.
- .2 Provide, use and maintain equipment listed in the off-site waste management plan.
- .3 The off-site waste management plan must provide, at a minimum, measures to:
 - .1 Dispose of debris at sites authorized by the MDDELCC, as identified in the management plan with their complete contact information.
 - .2 Recover, confine and process (if applicable) leachate dripping from contaminated material. In order to release to the environment, leachate must meet the surface water quality criteria set by the MDDELCC (protection de la vie aquatique – effet aigu), for suspended solids, PH, and C10-C50. For a discharge to the sewer, the leachate must comply with municipal sewage discharge standards. As a last resort, the leachate can be transferred to a treatment site, as identified in the management plan including its complete contact information. The Contractor must obtain authorization from the Departmental Representative prior to any release to the environment, sewage discharge or off-site disposal of the leachate.
 - .3 Minimize the emission of dust from the loadings and displacement of excavated materials. Tarpaulins must be installed on all trucks carrying the debris.
 - .4 Prevent spillage of liquids from debris or leachate loading. The leachate must be transported in watertight tanks or containers.
 - .5 Obtain a transport manifest for each load of solid material or leachate to be transported off-site. The transport manifests are prepared by the Departmental Representative and then handed over to the driver/carrier. The information required on the transport manifest is as follows:
 1. The name of the carrier.
 2. The vehicle registration.
 3. The date.
 4. The start time of the loading.
 5. The source of the load.
 6. The type of soil transported ("A-B", "B-C", "> C").
 7. The destination of the load.
 8. The signature of the Departmental Representative (coupon issuer).
 9. The signature of the Representative of the disposal site.
1. Issue copies of the transport manifests in the following manner:
 - .1 A copy of the transport manifest to the Departmental Representative at the work site.
 - .2 A copy of the transport manifest to the disposal site representative.

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- .3 A copy of the transport manifest to the Contractor and the duly completed by the site supervisor and added then to the payment slip.
- .4 A copy to the carrier.
- .5 Obtain a weighing ticket or transport voucher for each load of soil or leachate to be transported off-site. The contractor shall hand over the weighing ticket or transportation voucher to the Departmental Representative no later than the day after the shipment of the load. The information required on the weighing ticket or the transport voucher must be as follows:
 1. The name of the disposal site.
 2. The vehicle registration.
 3. The date.
 4. The arrival time of the loading.
 5. The source of the load.
 6. The type of soil transported ("A-B", "B-C", "> C").
 7. The tare of the vehicle.
 8. The weight in metric ton (soil) or volume in liters (leachate) of the load.
 9. The signature of the representative of the disposal site.

1.9 FINAL DECONTAMINATION

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

1.10 RECORD KEEPING

The Contractor must provide the Departmental representative with a daily work report showing the quantities of excavated materials and the quantities of materials transported off-site.

Partie 2 Products

2.1 NOT USED

- .1 Not Used.

Partie 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Partie 1 General

GENERAL NOTE: In the present section, the term “site” covers all of the facilities located on the site where construction is taking place (including the area actually under construction, buildings, access roads, infrastructure, parking facilities, etc.).

1.1 RELATED REQUIREMENTS

- .1 Section 01 11 00 - Summary of Work
- .2 Section 01 33 00 – Submittal Procedures

1.2 REFERENCES

- .1 Province of Quebec
 - .1 Act respecting occupational health and safety (CQLR c. S-2.1)
 - .2 Safety Code for the Construction Industry (CQLR S-2.1, r. 4)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with section 01 33 00 – Submittal Procedures.
- .2 Send the Departmental Representative the specific prevention program for the construction site, as described in “GENERAL REQUIREMENTS,” at least 10 days before the start of work.
- .3 The Departmental Representative will review the Contractor's site-specific prevention program and provide comments to the Contractor within ten (10) working days after receipt of this program. The Contractor shall revise the prevention program as appropriate and resubmit to the Departmental Representative within five (5) working days after receipt of comments from the Departmental Representative. The Departmental Representative reserves the right not to authorize work to begin on the site until the content of the prevention program is satisfactory. Thereafter, the Contractor must update its prevention program and resubmit to the Departmental Representative if the scope of the work changes, if the Contractor’s actual work methods differ from what it had originally planned, or if any other new condition applies.
- .4 The Departmental Representative's review of the Contractor's site-specific prevention program should not be construed as approval and does not reduce the Contractor's overall responsibility for construction health and safety.
- .5 Submit the Contractor's authorized representative’s work-site health and safety inspection reports to the Departmental Representative, minimum once a week.
- .6 Submit to the Departmental Representative, within 24 hours, a copy of any inspection report, correction notice or recommendations issued by federal, provincial or territorial health and safety inspectors.

- .7 Submit to the Departmental Representative, within 24 hours, an investigation report for any accident involving injury and any incident exposing a potential hazard.
- The investigation report must contain the following information, at a minimum:
1. the date, time and place of the accident;
 2. the name of the subcontractor involved in the accident;
 3. the number of persons involved and the condition of the persons injured;
 4. the identities of the witnesses;
 5. a detailed description of the duties being performed at the time of the accident;
 6. the equipment being used to perform those duties at the time of the accident;
 7. the corrective measures taken immediately after the accident;
 8. the causes of the accident;
 9. the preventive measures taken to avoid a similar accident.
- .8 Submit the WHMIS material safety data sheets to the Departmental Representative in accordance with section 01 33 00. The Contractor must also keep copies of these data sheets on the construction site.
- .9 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work. Send the Departmental Representative an additional certification for any new employee working on the site.
- .10 Send the Departmental Representative an emergency response plan at the same time as the prevention program. The emergency response plan must contain the information listed under the heading "GENERAL REQUIREMENTS" in this section.
- .11 Send the Departmental Representative copies of training certificates for the workers on the job site, including the following training (when applicable):
- .1 first aid in the workplace and cardiopulmonary resuscitation (CPR);
 - .2 work liable to produce asbestos dust emissions (mandatory for any work in the presence of asbestos);
 - .3 work in confined spaces (mandatory for any work in confined spaces);
 - .4 lockout (mandatory for any work requiring lockout);
 - .5 safe operation of fork-lifts (mandatory for any use of fork-lifts);
 - .6 safe operation of lifting platforms (mandatory for any use of lifting platforms);
 - .7 any other training required by regulations or by the prevention program. In addition, the Health and Safety on Construction Sites course certificates must be available on the work site on request.
- .12 Engineer's plans and certificates of compliance: the Contractor must send the Departmental Representative and the CNESST copies, bearing an engineer's signature and seal, of all plans required under the *Safety Code for the Construction Industry* (S-2.1, r. 4) or under other statutes or regulations or another clause in the specifications or

contract. The Contractor must also send a compliance certificate signed by an engineer once the facility for which these plans were designed has been completed and before anyone uses the facility. Copies of these documents must be available on the construction site at all times.

1.4 PRODUCTION OF THE NOTICE OF OPENING OF A CONSTRUCTION SITE

- .1 Before work begins, send the Notice of Opening of a Construction Site to the CNESST. Send the Departmental Representative a copy of this notice and of the acknowledgement of receipt returned by the CNESST.

When all the work is done, the notice of closing must be sent to the CNESST, with a copy to the Departmental Representative.
- .2 The Contractor shall play the role of Principal Contractor at all times within the perimeter of the construction site and anywhere else where the Contractor must perform work as part of the present project. The Contractor must acknowledge its responsibility as Principal Contractor and identify itself as such in the Notice of Opening of a Construction Site that it sends to the CNESST.
- .3 The Contractor shall install proper site separation and identification in order to maintain time and space at all times throughout the life of the project.

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

- .1 Schedule and administer a health and safety meeting with the Departmental Representative prior to commencement of work.
- .2 A decision-making representative of the Contractor must attend all meetings dealing with health and safety on the construction site.
- .3 If it is expected that there will be 25 or more workers on the construction site at any given time during the project, the Contractor shall establish a job-site committee and hold meetings as required by the *Safety Code for the Construction Industry* (S-2.1, r. 4). Minutes of each job-site committee meeting shall be sent to the Departmental Representative within five (5) days of the meeting.

1.7 REGULATORY REQUIREMENTS

- .1 Comply with all statutes, regulations and standards applicable to the performance of the work.
- .2 Comply with prescribed standards and regulations to guarantee normal progress of work on land contaminated by hazardous or toxic materials.
- .3 Always use the most recent version of the standards cited in the *Safety Code for the Construction Industry* (S-2.1, r. 4), regardless of the date shown in the Code.

1.8 COMPLIANCE REQUIREMENTS

- .1 Comply with the *Act respecting occupational health and safety* (CQLR c S-2.1) and the *Safety Code for the Construction Industry* (S-2.1, r. 4), as well as all of the requirements in the present specifications.

1.9 RESPONSIBILITIES

- .1 The Contractor shall accept and assume all of the duties and obligations normally assigned to the Principal Contractor under the *Act respecting occupational health and safety* (CQLR c S-2.1) and the *Safety Code for the Construction Industry* (S-2.1, r. 4).
- .2 The Contractor shall be responsible for the health and safety of persons on site, safety of property on site and protection of persons adjacent to the site and of the environment to the extent that they may be affected by conduct of the work.
- .3 Regardless of the size and location of the site, the Contractor shall clearly delimit its boundaries by physical means. The Contractor shall also comply with the specific requirements of the regulations on this subject. The means chosen to delimit the site must be submitted to the Departmental Representative.
- .4 Comply with and enforce compliance by employees with safety requirements of contract documents, applicable federal, provincial, territorial and local statutes, regulations and ordinances, and with site-specific prevention program.

1.10 WORK PERFORMED BY EXTERNAL CONTRACTORS

- .1 It is expected that on this construction site, the following work will be performed by an external contractor whose services have not been retained by the Contractor:
- .2 The Contractor shall take the necessary measures to protect the health and safety of external contractors who have no contractual relationship with the Contractor but who have been engaged by the Departmental Representative to perform certain work. In return, such external contractors are required to submit to the authority of the Contractor (as Principal Contractor). A subordination agreement to this effect shall be signed by the Contractor and by every external contractor and submitted to the Departmental Representative before that external contractor's work begins (see the wording of the OCCUPATIONAL HEALTH AND SAFETY SUBORDINATION AGREEMENT at the end of this section).

1.11 GENERAL REQUIREMENTS

- .1 Before undertaking the work, write a site-specific prevention program based on the prior assessment of the risks/dangers in accordance with the "SAFETY ASSESSMENT" and "RISKS ASSOCIATED WITH JOB SITE" paragraphs in the present section. Implement, maintain and enforce the program until final demobilization from the site. The prevention program must take the particular characteristics of the project into account and must cover all of the work to be done on the site.

At a minimum, the prevention program must include the following information:

- .1 the company's health and safety policy;
- .2 a description of the stages of the work;

- .3 the total cost of the work, the work schedule, and the forecast staffing curve;
- .4 the organization chart showing responsibilities for health and safety;
- .5 the physical and material organization of the work site;
- .6 identification of the risks for each stage of the work, the corresponding preventive measures, and the procedures for applying them;
- .7 identification of the preventive measures related to the risks specific to the job site and listed in the “RISKS ASSOCIATED WITH JOB SITE” paragraph;
- .8 identification of preventive measures for the health and safety of employees and/or the public on the work site as indicated in the “SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF SITE OCCUPANTS AND THE PUBLIC” paragraph;
- .9 the training required;
- .10 the procedure in case of accident or injury;
- .11 a written commitment by everyone involved to comply with this prevention program;
- .12 a construction site inspection grid based on the preventive measures;
- .13 the emergency response plan, which must contain the following information at a minimum:
 - .1 procedure for evacuating the job site;
 - .2 identification of resources (police, firefighters, ambulances, etc.);
 - .3 identification of the persons responsible on the job site;
 - .4 identification of first aid workers;
 - .5 communication organization chart (including the site manager and the Departmental Representative);
 - .6 the training required for the persons responsible for carrying out this plan;
 - .7 any other information that is necessary, given the site’s characteristics.
- .14 The Departmental Representative shall provide the Contractor with the evacuation procedure for the site, if applicable; the Contractor shall then adjust the work procedure to site conditions and submit it to the Departmental Representative.
- .2 The Departmental Representative may respond in writing, where deficiencies or concerns are noted in the prevention program, and may request re-submission with correction of deficiencies or concerns.
- .3 In addition to the prevention program, in the course of the work the Contractor shall prepare and send the Departmental Representative a specific written procedure for any work that poses a high risk of accidents (examples: demolition procedures, special installation procedures, hoisting plans, procedures for work in confined spaces, electrical power cutoff procedures) or that is requested by the Departmental Representative.
- .4 The Contractor shall plan and organize the work so as to help eliminate sources of hazards and ensure collective protection and thereby minimize the use of personal protective equipment.

- .5 A piece of equipment, tool or protection method that cannot be installed or used without compromising the health and safety of workers or the public shall be deemed unsuitable for the work to be performed.
- .6 All mechanical equipment (including but not limited to devices for hoisting persons or materials, power shovels, concrete pumps and concrete saws) must be inspected before being delivered to the job site. The Contractor shall obtain an inspection certificate signed by a mechanic and dated less than one week before each piece of equipment arrives on the site, and retain it on the site. The Contractor shall provide this certificate to the Departmental Representative upon request.
- .7 Ensure that all daily, periodic, annual and other inspections that the applicable standards require to be performed on equipment used to lift persons or materials are performed, and submit copies of the inspection certificates to the Departmental Representative on request.
- .8 Whenever the Departmental Representative suspects a defect or accident risk, he or she may order the immediate shutdown of any equipment and require an inspection by a specialist of his or her choosing.
- .9 The Departmental Representative shall be consulted about the locations of gas cylinders and gas tanks on the job site.

1.12 RISKS ASSOCIATED WITH JOB SITE

- .1 In addition to risks related to the duties to be performed, the personnel who do the work on the job site will be exposed to the following risks associated with the location where this work will be performed.
- .2 At the location where this work will be performed, there are:
 - .1 Vehicular traffic
 - .2 Pedestrian and bicycle traffic
 - .3 Concrete slabs with structural restrictions;
 - .4 Confined spaces;
 - .5 Underground services (electric, gas, vapour, water system, etc.).
- .3 The Contractor shall perform an assessment of the risks associated with the site to validate this information and to see whether any other risks are present on the site. All of the risks identified in this assessment must then be included in the Contractor's prevention program

1.13 SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF SITE OCCUPANTS AND THE PUBLIC

- .1 The site where the work will be done is occupied by employees and/or the public at all times, although these persons do not have access to the Contractor's job site. The Contractor must meet the following specific requirements for protecting employees and/or the public:
- .2 Maintain the flow of vehicular, pedestrian and bicycle traffic

These requirements must be included in the Contractor's prevention program, along with all of the steps that the Contractor plans to take to protect the health and safety of the employees and/or the public present on the site.

1.14 UNFORESEEN HAZARDS

- .1 If a source of danger that is not specified in the contract documents and could not be identified in the preliminary construction site inspection arises as a result of or in the course of the work, the Contractor shall immediately suspend work, notify the Health and Safety Officer on the construction site, take appropriate temporary measures to protect workers and the public, and alert the Departmental Representative both orally and in writing. The Contractor shall then make the necessary modifications to the prevention program and implement the safety measures necessary so that the work can resume.

1.15 HEALTH AND SAFETY OFFICER

- .1 If the construction site meets the criteria set out in section 2.5.3 of the *Safety Code for the Construction Industry* (S-2.1, r. 4), then the Contractor shall hire a qualified person who is authorized to act as Safety Officer and shall assign that person full-time as soon as the work begins. The duties of this person shall be dedicated exclusively to managing health and safety on the construction site. The Health and Safety Officer must:
 - .1 hold a safety officer certificate issued by the CNESST;
 - .2 have at least 5 years of practical experience on a construction site where associated activities similar to those on this project were carried out;
 - .3 have working knowledge of occupational safety and health regulations;
 - .4 be responsible for the Contractor's health and safety training sessions and ensure that only personnel who have successfully completed the required training are permitted to enter the site to perform work;
 - .5 be responsible for implementing, enforcing in minute detail and monitoring the Contractor's site-specific health and safety program;
 - .6 be present on the construction site at all times when the work is being performed;
 - .7 inspect the work and ensure that it complies with all regulatory requirements as well as the requirements specified in the contract documents and the prevention program;
 - .8 maintain a daily log of his or her activities and submit a copy to the Departmental Representative at least once per week.
- .2 The safety officer certificate must be sent to the Departmental Representative before the work begins.
- .3 When the Contractor is not required to hire a Safety Officer, or when this officer is hired by the Departmental Representative, the Contractor shall appoint a qualified person as health and safety supervisor and coordinator, regardless of the size of the construction site or the number of workers present. This person must be present on the construction site at all times and must be able to take all necessary steps to ensure the health and safety of the people and property on the site and in the area immediately around it that might be affected by performance of the work. The Contractor must submit this person's name to the Departmental Representative before the work begins.

1.16 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are prominently posted on site in accordance with provincial acts and regulations, and in consultation with the Departmental Representative.
- .2 At a minimum, the following information and documents must be posted at a location easily accessible to the workers:
 - .1 Construction site opening notice;
 - .2 Identity of the Principal Contractor;
 - .3 Company's occupational health and safety policy;
 - .4 Site-specific prevention program;
 - .5 Emergency response plan;
 - .6 Minutes of meetings of the job-site committee;
 - .7 Names of the representatives on the job-site committee;
 - .8 Names of the first aid workers;
 - .9 Intervention and correction reports issued by the CNESST.

1.17 INSPECTIONS AND CORRECTIONS IN CASES OF NON-COMPLIANCE

- .1 Inspect the work premises, fill out the construction site inspection grid, and submit it to the Departmental Representative in accordance with the "ACTION AND INFORMATION SUBMITTALS" paragraph in the present section.
- .2 Immediately take the steps necessary to correct any non-compliant situations found in the inspections mentioned in the preceding paragraph or by the competent authority or by the Departmental Representative or his or her mandatary.
- .3 Provide the Departmental Representative with a written report on action taken to correct the identified health and safety non compliance issues.
- .4 The Contractor must give the Safety Officer or, where there is no Safety Officer, the person assigned to take care of health and safety, full authority to order the stoppage and resumption of work when this person deems it necessary or desirable for reasons of health and safety. This person must ensure that the health and safety of the public and of construction site workers and the protection of the environment always take precedence over work costs and the work schedule.
- .5 The Departmental Representative or his or her delegate may stop work if non-compliance with health and safety regulations is not corrected. Without limiting the scope of the preceding paragraphs, the Departmental Representative may also order the stoppage of work at any time if he or she perceives a hazard or risk to the health or safety of construction site staff, the public or the environment.

1.18 PREVENTION OF VIOLENCE

- .1 Managing health and safety on Public Works and Government Services Canada construction sites includes taking steps to protect the psychological health of all persons who enter the site where the work takes place. Hence, in addition to physical violence,

verbal abuse, bullying and harassment shall not be tolerated on the site. Any person who engages in such behaviour shall receive a warning and/or might be expelled from the site permanently by the Departmental Representative.

1.19 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative.
- .2 Any operation involving explosives must be conducted under the immediate supervision of a qualified blaster.
- .3 The purchase, transportation, storage and use of explosives must comply with the provisions of the applicable federal and provincial legislation:
 - .1 Canada: Explosives Act (E-17), Explosives Regulations (C.R.C. c. 599), Magazine Standards for Blasting Explosives and Detonators, Transportation of Dangerous Goods Act and Regulations;
 - .2 Quebec: Act respecting explosives (E-22), Regulation under the Act respecting explosives (E-22, r. 1), Safety Code for the Construction Industry (S-2.1, r. 4), Transportation of Dangerous Substances Regulation.
- .4 The Contractor shall obtain all permits required under the aforementioned acts and regulations and shall keep copies of these permits readily accessible on the construction site.
- .5 The Contractor shall facilitate visits to the construction site and explosives magazines and inspections of vehicles used to transport explosives, for all government representatives and police officers with jurisdiction over explosives.

1.20 POWDER ACTUATED DEVICES

- .1 Not used.

1.21 USE OF PUBLIC THOROUGHFARES

- .1 When, for operational reasons or to ensure the safety of workers, occupants or the public, it is necessary to impinge on the public thoroughfare (for example, by using scaffolding or cranes or doing excavation work), the Contractor shall, at its own expense, obtain all of the authorizations and permits required by the authority that has jurisdiction.
- .2 The Contractor shall install, at its own expense, all signage, barricades and other devices required by regulation to ensure the safety of the public and of its own facilities.

1.22 LOCKOUT

- .1 For any work on equipment that is powered by electricity or by any other source of energy, the Contractor shall submit a general lockout procedure to the Departmental Representative and put that procedure into effect.
- .2 Supervisory personnel and all workers concerned with the work requiring lockout must have taken lockout training provided by a recognized agency; the Contractor shall submit the training certificates to the Departmental Representative.

- .3 Before undertaking the lockout of a piece of equipment on an occupied site, the Contractor shall coordinate its work with the site representative if cutting off the energy sources may have an impact on the site's operations or its occupants.
- .4 The Contractor shall identify a qualified person to be responsible for lockout and shall ensure that this person writes a lockout procedure for each piece of equipment that has to be locked out. This procedure shall be sent to the Departmental Representative at least 48 hours before the work begins; the Departmental Representative shall have this procedure verified by a representative of the site if the work is taking place in an existing building. The lockout procedure must contain the following information, at a minimum:
 - .1 description of the work to be done;
 - .2 identification, description and location of the circuit and/or equipment to be locked out;
 - .3 identification of the energy sources that power the equipment;
 - .4 identification of each of the cutoff points;
 - .5 sequence for lockout and for release of residual energy, as well as the unlocking sequence;
 - .6 list of materials needed for lockout;
 - .7 method for verifying zero energy state;
 - .8 name and signature of the person who has written the procedure.
- .5 At the Departmental Representative's request, the Contractor shall record all this information on the site representative's form.
- .6 At the time of lockout, the person responsible shall date the procedure and ensure that every worker involved in the work on the locked out circuit/equipment writes his or her name on the procedure and signs it.

1.23 ELECTRICAL WORK

- .1 The Contractor shall ensure that all electrical work is performed by employees who are qualified under provincial regulations on professional qualification and training.
- .2 The Contractor shall comply with the requirements of CSA standard Z462, *Workplace electrical safety*.
- .3 Any work on a piece of electrical equipment must be done with this equipment in a de-energized condition, unless it is not possible to de-energize this equipment completely.
- .4 The Contractor shall satisfy all the requirements of the Lockout paragraph of the present section.
- .5 For any work that cannot be done in a de-energized condition, the Contractor shall notify the Departmental Representative in writing and obtain his or her authorization. The Contractor must demonstrate to the Departmental Representative that the work cannot be done in a de-energized condition, and shall provide all of the information needed to fill out and obtain an energized electrical work permit (work method, evaluation of the degree of electrical arc, protection boundaries, protective equipment, etc.) before the

work begins, except in the cases for which exceptions are provided in CSA standard Z462, *Workplace electrical safety*.

- .6 The energized electrical work permit shall include, but not be limited to, the following:
 - .1 a description of the circuit and equipment to be worked on;
 - .2 a justification for why the work needs to be performed in an energized condition;
 - .3 a description of the safe work practices to be employed;
 - .4 the results of the shock risk assessment;
 - .5 a determination of the shock approach boundaries;
 - .6 the results of the arc flash risk assessment;
 - .7 a description of the arc flash boundary;
 - .8 a description of the personal protective equipment required;
 - .9 a description of the means employed to restrict the access of unqualified persons to the work area;
 - .10 evidence of completion of a job briefing;
 - .11 energized work approval signature(s) (by authorizing or responsible management, a Safety Officer, an owner, etc.).
- .7 If the site representative requires the Contractor to perform energized electrical work in order to satisfy the operational requirements of the site occupants, then the Contractor shall obtain all of the information needed to fill out an energized electrical work permit (work method, evaluation of the degree of electrical arc, protection boundaries, protective equipment, etc.) and have it signed by the site representative designated by the Departmental Representative before the work begins.

1.24 EXPOSURE TO ASBESTOS

- .1 Not used.

1.25 FUNGAL CONTAMINATION

- .1 Not used.

1.26 EXPOSURE TO SILICA

- .1 For any indoor or outdoor work that generates silica dust, the Contractor shall meet the following requirements, in addition to those of the *Safety Code for the Construction Industry* (S-2.1, r. 4).
 - .1 Work in a damp environment or use tools supplied with water to reduce dust generation, or capture dust at source and retain it in a high-efficiency filter to prevent it from spreading into the environment.
 - .2 Clean surfaces and tools with water, and never with compressed air.
 - .3 Sand and strip surfaces using an abrasive containing less than 1% silica (also known as amorphous silica).
 - .4 Install screens or partitions to prevent dust from spreading outside the work area and thereby protect other workers and the public.

- .5 Wear protective equipment for respiratory passages and eyes during any operations that may produce silica dust, in accordance with the requirements of the Safety Code for the Construction Industry (S-2.1, r. 4).
- .6 Wear a protective suit to prevent contamination outside the site.
- .7 Do not eat, drink or smoke in a dusty area.
- .8 Wash hands and face before eating, drinking or smoking.

1.27 SANDBLASTING

- .1 Prior to starting any sandblasting work, the Contractor must:
 - .1 Provide a written procedure of the work that meets the requirements of section 3.20. of the Code de sécurité pour les travaux de construction, S-2.1, r.4 (Safety code for the Construction Industry).
 - .2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.
 - .3 All sanding and sandblasting work shall be done by using an abrasive containing less than 1% of silica.

1.28 REMOVAL OF LEAD-BASED PAINT

- .1 Prior to all work where workers are likely to handle materials containing lead-base paint or other substances containing lead, the Contractor must:
 - .1 Provide a written procedure for the work which respects all the requirements of the Code de sécurité pour les travaux de construction S-2.1, r- 4, (Safety code for the construction industry), as well as the requirements indicated in the document “Guideline for Lead on Construction Projects” published by the Ontario Ministry of Labour (http://www.labour.gov.on.ca/english/hs/pdf/gl_lead.pdf). If there is a discrepancy between the Québec regulation and the Ontario document, the most stringent requirement shall apply.
 - .2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

1.29 EXPOSURE TO ANIMAL EXCREMENT

- .1 Before starting any work in which workers may come into contact with materials contaminated with animal excrement, the Contractor shall:
 - .1 Provide a written work procedure that meets the requirements of the Safety Code for the Construction Industry (S-2.1, r. 4) as well as those set out in Des fientes de pigeons dans votre lieu de travail : méfiez-vous, published by the CNESST (http://www.csst.qc.ca/publications/100/Documents/DC100_1331_1web2.pdf)
 - .2 Demonstrate that it has readily available all necessary material and equipment to comply with the procedure and ensure safe performance of the work.

1.30 RESPIRATORY PROTECTION

- .1 The Contractor shall ensure that all workers who must wear respiratory protective equipment in the course of their duties have taken training in the use of this equipment and undergone fit tests for their personal respiratory protective equipment, in accordance with CSA standard Z94.4, *Selection, use and care of respirators*. The certificates for the fit tests shall be provided to the Departmental Representative on request.

1.31 PREVENTING FALL HAZARDS

- .1 Plan and organize the work so as to help eliminate sources of fall hazards and ensure collective protection and thereby minimize the need to use personal protective equipment. Where personal protection against falls is required, workers must use a safety harness that complies with standard CAN/CSA-Z-259.10-M90. A safety belt must not be used as protection from falls.
- .2 All persons who use lifting platforms (scissor lifts; telescopic, articulating or rotating booms; etc.) must have received training in their use.
- .3 Wearing a safety harness is mandatory on all lifting platforms with a telescopic, articulating or rotating boom.
- .4 Delimit a hazard zone around every lifting platform.
- .5 Every opening in a floor or roof, regardless of the dimensions of this opening and the height of the fall, must be surrounded by a guardrail or covered with a cover that is attached to the floor and that can withstand the loads to which it will be subjected.
- .6 Every person working within two metres of a location that presents a risk of falling 3 metres or more must use a safety harness as required by the regulations, unless there is a guardrail or other feature affording equivalent safety.
- .7 Regulatory requirements notwithstanding, the Departmental Representative may require the installation of a guardrail or the use of safety harnesses for certain special situations that present risks of falling less than 3 metres.

1.32 SCAFFOLDING

- .1 In addition to the requirements of the Code de sécurité pour les travaux de construction (Safety code for the construction industry), the Contractor who uses scaffoldings must respect the following requirements:

Foundation

1. Scaffoldings shall be installed on a solid foundation so that it does not slip or rock.
2. Contractors wishing to install scaffolding\$ on a roof, overhang, canopy or awning shall submit their calculations and loads, as well as plans signed and sealed by an engineer to the Departmental representative and obtain his authorization before beginning installation.

Assembly, bracing and mooring

1. All scaffoldings shall be assembled, braced and moored in accordance with the manufacturer's instructions and the provisions of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry).
2. Where a situation requires the removal of part of the scaffoldings (e.g., crosspieces), the Contractor shall submit to the Departmental representative an assembly procedure signed and sealed by an engineer certifying that the scaffolding assembled in that manner will allow the work to be done safely given the loads to which it will be subject.
3. For scaffoldings where the span between two supports is greater than three metres, the Contractor shall provide the Departmental representative an assembly plan signed and sealed by an engineer.

Protection against falls during assembly

1. Workers exposed to the risk of falling more than three metres shall be protected against falls at all times during assembly.

Platforms

1. Scaffolding platforms shall be designed and installed in accordance with the provisions of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry).
2. If planks are used, they shall be approved and stamped in accordance with section 3.9.8 of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry).
3. Scaffoldings of four sections (or six metres) high or more shall have a full platform covering the entire surface between the putlogs every three metres high or fraction thereof, and the components of that platform shall not be moved at any time to create an intermediate landing.

Guardrails

1. A guardrail shall be installed on every landing.
2. Cross braces shall not be considered as guardrails.
3. If the platforms are not covering the entire surface between the putlogs, the guardrail must be installed just above the edge of the platform so that there is no empty horizontal space between the platform and the guardrail.
4. Where scaffoldings has four sections (or six metres) high or more and full platforms are required, the guardrails shall be installed on each landing at the start of work and shall remain in place until the work is completed.

Access

1. The Contractor shall ensure that access to the scaffoldings does not compromise worker safety.
2. Where the platforms of the scaffoldings are comprised of planks, ladders shall be installed in such a way that planks extending beyond the platform do not block the way up or down.

3. Notwithstanding the provisions of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), stairs shall be installed on all scaffoldings that have six or more rows of uprights or is six sections (or nine metres) high or higher.

Protection of the public and occupants

1. When scaffoldings are installed in a zone accessible to the public, the Contractor shall take the necessary measures to prevent the public from having access to them and, if applicable, to the work or storage area located in the vicinity of these scaffolding.
2. Contractor must install covered walkways, nets or other similar devices to protect workers, the public and the occupants against falling objects. The means of protection must be approved by the Departmental representative.

Engineering plans

1. In addition to those required by the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Departmental representative reserves the right to require engineering plans for other types or configurations of scaffoldings.
2. A plan signed and sealed by an engineer is required for all scaffoldings that will be covered with a canvas, a tarpaulin or any other material that has wind resistance.
3. A certificate of conformity signed by an engineer is required in all cases where an engineering plan is required for the installation and this, before anybody uses the facility. A copy of these documents must be available on the construction site at all times.

1.33 CONFINED SPACES

- .1 In addition to the requirements of the provincial regulation applicable to confined spaces, the Contractor must respect the requirements in the following paragraphs.
- .2 The Departmental representative reserves the right, depending on the nature of the risk of the confined spaces, of the work to be done and/or of the level of competence in confined spaces demonstrated by the Contractor, to require from the latter that he use the services of a firm specialized in health and safety or in confined space work to perform the analysis of the risks inherent to the confined spaces, to complete the entry permit, to conduct surveillance of the work or for any other task related to the work in confined spaces.

Information on confined spaces existing on the construction site

1. The following presents a non-exclusive list of the confined spaces that the Contractor will likely have to access during this project:

List of confined spaces

2. The Contractor shall take into consideration each of these confined spaces and must also add to this list the confined spaces that he is likely to build/install during this project.

Person in charge of the health and safety for the work in confined spaces

1. The Contractor shall designate a person to be in charge of the health and safety for the work in confined spaces. This person shall be qualified, as defined in the article 297 of the *Règlement sur la santé et la sécurité du travail* (S-2.1, r.13) (Occupational Health and Safety Regulation). This person must be present at all times during work in confined spaces and must make sure that all the requirements of the regulation and the ones specified in this section are respected. This person must amongst other things fill out and issue the entry permit for the confined spaces.

Training

1. All persons having access to a confined space, including the person in charge and the watcher of the confined space shall have completed training on entry in confined spaces.
2. All persons who have to use supplied-air respirator to access the confined spaces shall have completed training on the use of these apparatus.
3. All persons identified as rescuers for confined spaces shall have completed training on confined spaces rescue.
4. Each training required in the preceding paragraphs must be provided by a firm specialized in health and safety or in confined spaces.
5. The training certificates of the persons mentioned above must be submitted to the Departmental representative before the beginning of the work in confined spaces.

Risk assessment of confined spaces

1. For each of the confined spaces listed at the beginning of this article, the Contractor must obtain the necessary information from the site representative and proceed to the assessment of the risk inherent to each confined space and relative to:
 - a. the prevailing internal atmosphere, namely the concentration of oxygen, inflammable gases and vapours, combustible or explosive dusts as well as the categories of contaminants likely to be present in this enclosed area or nearby;
 - b. the fact that the natural or mechanical ventilation is insufficient
 - c. The materials that are present there and that can cause the worker to sink, to be buried or to drown, such as sand, grain or a liquid;
 - d. the interior configuration;
 - e. pipes and conduits penetrating the confined space;

- f. energies such as electricity, moving mechanical parts, heat stress, noise and hydraulic energy;
- g. ignition sources such as open flames, lighting, welding and cutting, static electricity or sparks;
- h. all other particular circumstances, such as the presence of vermin, rodents or insects.

These risk assessments must be done by the person in charge of the health and safety of the work in confined spaces. They must be submitted to the Departmental representative for analysis at least 10 days before the proposed date for the work in confined spaces and they must also include the following information:

- a. location of the confined space;
- b. description of the confined space;
- c. dimensions of the confined space;
- d. number, location and dimensionS of the openings;
- e. content of the confined space (material, substances, etc.)
- f. date of the assessment;
- g. name and signature of the person who conducted the assessment and the name of his employer.

The Contractor must repeat the same process for each of the confined spaces that he will build/install during this project.

Confined spaces entry permits

1. At least 5 days before the scheduled date for the work in a confined space the Contractor must submit for analysis to the Departmental representative a copy of each entry permit specific to the confined spaces where he must access. The entry permits must be completed by the person in charge of the health and safety of the work in confined spaces, and must contain the following information as a minimum:
 - a. description of the work that will be carried out and the method of work, including the materials and tools needed to do this work;
 - b. description of the risks and corresponding preventive measures according to the risk assessment inherent to the confined space done previously and according to the work to be carried out;
 - c. safety equipment that will be used to control the risks of confined spaces (e.g.: fan, gas detectors, local exhaust ventilation, personal protective equipment, etc.);
 - d. rescue procedure covering at least the following:
 - e. means of communication between the supervisor of the confined space and the workers in the confined space;
 - f. lifesaving equipment specific to each confined space;
 - g. confirmation that the municipal emergency response service has been advised that work in confined spaces would be going on at this specific construction site and that they may intervene do to a confined space rescue; otherwise, the Contractor must identify the workers on the construction site that will act as rescuers in a confined space in the case where such rescuers must enter the confined space (rescue training is mandatory);

- h. location of telephone and phone number of the municipal emergency response service (if applicable);
 - i. date of entry permit;
 - j. name of person who issued the permit and the name of his employer;
 - k. name of the confined space safety watcher and the name of his employer;
 - l. name of the workers who must enter the confined space and the name of each one's employer.
2. In cases where the site representative requires the use of a confined space entry permit specific to his site, the Contractor must comply with the requirements of that permit.

Medical surveillance

1. The Contractor must submit to the Departmental representative a medical certificate dated in the last two years for all persons who must use a supplied-air respirator. The certificate must confirm the ability of each person to use this type of apparel.
2. It is recommended that the persons who have to work in sewer collection systems or other similar systems be vaccinated against diphtheria, tetanus and hepatitis "B".

Requirements while working in confined spaces

1. Before each entry into a confined space, the person in **charge** of the health and safety for the work in confined spaces shall take readings of oxygen concentration, flammable gases and all toxic gases likely to be present and record these readings on the entry permit required earlier.
2. No worker can access the confined space if the following requirements are not respected:
 - a. the concentration of oxygen shall be greater than or equal to 19.5% and less than or equal to 23%;
 - b. the concentration of inflammable gases or vapours shall be less than or equal to 10% of the lower explosion limit;
 - c. the concentration of other gases must not exceed the standards prescribed in annex I of the *Règlement sur la santé et la sécurité du travail* (S-2.1, r.13) (Occupational Health and Safety Regulation).
3. If the oxygen and gas concentrations measured respect the regulatory values, the person in charge of the health and safety for the work in confined spaces must ensure that all preventive measures indicated on the permit are in place and then must complete the entry permit (date, time, signatures, etc.) before issuing the permit and allow entry into the confined space.
4. A permit is only valid for one work shift; the Contractor must submit a new permit for each extra shift.

5. During the work inside the confined space, the gas concentration must be measured continuously and the gas detector must be installed at ~~the level of the~~ breathing area of the workers. If the conditions inside the confined space are such that the workers might not hear/see the detector's alarm, the Contractor must find a way for the confined space safety watcher to watch the concentration measures while maintaining the measurements at the level of the breathing zone of the workers.
6. If the work is organized in a way that the workers are scattered far away from each other in a large confined space, the Contractor needs to provide additional gas detectors.
7. The Contractor must provide the gas detectors and maintain them in good condition. He must be able to show that the gas detectors used have been calibrated and adjusted by the person in **charge** of the health and safety for the work in confined spaces or by a qualified person, in accordance with the manufacturer's recommendations. The Departmental representative can at all times have the accuracy of the measuring devices checked. In the event of the failure of a detection device, the work must be stopped immediately and all workers must leave the confined space.
8. The manufacturer's manual of the gas detectors must be available on the construction site.
9. The Contractor shall provide a ventilation system to keep concentrations of contaminants below the regulatory limits.
10. If work generating contaminants are performed (welding, use of products, etc.), the Contractor must, if needed, install an aspiration system for the contaminants so that the regulatory values of air quality can be maintained at all times.
11. If a detecting device alarm goes off, all workers shall leave the confined space. The measured levels of concentration must then be recorded on the entry permit. The Contractor shall then find the source of contamination, neutralize it, ventilate the confined space to eliminate contaminant residues and authorize access to the confined space only when concentrations of oxygen and gas have returned to normal.
12. Compressed gas cylinders or welding equipment shall not be brought into confined spaces: this equipment shall remain outside and shall not block entrances or exits; all cylinders shall be properly secured.
13. Tools and electrical devices used to work in the confined spaces shall be grounded and, when necessary, designed to be explosion-proof. All equipment must be connected to a ground fault interrupter outlet or to a step-down transformer. The Contractor shall, at his own cost, hire a qualified electrician to adjust power receptacles and/or circuit breakers that he intends to use which do not meet these criteria.
14. The Contractor shall obtain a Hot Work Permit and respect the requirements to that effect when the work to be carried out includes hot work.

15. The Contractor must assign a competent person to assume the duties of confined space safety watcher. The supervisor shall be exclusively dedicated to these duties and must constantly remain outside of the confined space as long as there is a worker in it. He must also:
- a. ensure that the entry permit has been filled, signed and posted near the confined space;
 - b. be familiar with the work procedure specific to the confined space and ensure that it is respected;
 - c. ensure continuous communication with all the workers in the confined space and ensure that all the equipment required in case of emergency is present;
 - d. have a good knowledge of the backup-ventilation systems and ensure their proper functioning for the duration of the work;
 - e. prevent access to unauthorized persons;
 - f. ensure that the conditions around the confined space zone is not a health or security risk for the workers inside the confined space;
 - g. initiate the emergency procedure if needed.
16. The same person may act as a confined space safety watcher and as the person in charge of the health and safety of the work in confined spaces, provided all requirements of both functions are met.

.3

1.34 DIGGING WORK

- .1 In addition to the requirements of the Code de sécurité pour les travaux de construction (Safety code for the construction industry), the Contractor who performs the digging of trenches or excavations must respect the following requirements:
- .1 Fill out the following form and submit it to the Departmental representative before beginning to excavation work.
 - .2 Submit to the Departmental representative, as appropriate, the following documents:
 - a. plans and specifications, signed and sealed by an engineer, of the shoring needed to be installed for the excavation work; or
 - b. engineer's advice specifying the wall angles of the trench or excavation.

		Directive de creusage N° _____ de _____												
<p>Cette directive de creusage est fournie à titre d'exemple par la Commission de la santé et de la sécurité du travail (CSST). On y trouve les principales indications que l'employeur devrait donner à la personne responsable des travaux sur le terrain et à l'opérateur de l'équipement de terrassement.</p>														
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Méthode de travail à utiliser Tout en s'assurant que les parois ne présentent aucun danger de glissement de terrain, <input checked="" type="checkbox"/> creuser et étançonner selon les plans et devis d'un ingénieur; <input type="checkbox"/> creuser et étançonner en utilisant une boîte de tranchée; <input type="checkbox"/> creuser sans étançonner pourvu que l'une des conditions suivantes soit respectée : <input type="checkbox"/> le roc est sain; <input type="checkbox"/> aucun travailleur ne descend dans la tranchée ou l'excavation; <input type="checkbox"/> les parois sont creusées conformément à l'avis d'un ingénieur.														
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Mesures de sécurité Déposer les matériaux à une distance d'au moins 1,2 mètre (4 pi) du sommet des parois. Ne laisser aucun véhicule s'approcher à moins de 3 mètres (10 pi) du sommet des parois. <input type="checkbox"/> Respecter le plan de localisation concernant les travaux à proximité d'une construction existante. <input type="checkbox"/> Suivre le plan de localisation pour repérer les infrastructures souterraines. <input type="checkbox"/> Installer le matériel de signalisation prévu par le plan de circulation (barrières, repères visuels, etc.). <input type="checkbox"/> Affecter un ou des signaleurs au contrôle de la circulation. <input type="checkbox"/> Respecter la méthode prévue pour le travail à proximité des lignes électriques. <input type="checkbox"/> Mettre en place les dispositifs de protection des travailleurs, par exemple les glissières de sécurité en béton.														
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Directive rendue <input type="checkbox"/> au responsable des travaux sur le terrain <input type="checkbox"/> à l'opérateur de l'équipement de terrassement														

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1.35 HOISTING LOADS WITH A CRANE OR A CRANE TRUCK

- .1 Unless otherwise instructed, for any hoisting operations to be performed with a crane or a crane truck, the Contractor shall prepare a hoisting plan and submit it to the Departmental Representative at least 5 days before the start of such operations. At a minimum, this hoisting plan must contain the information listed at the end of the present section.
- .2 For the following kinds of hoisting operations, the hoisting plan must bear the signature and seal of an engineer:
 - a. lifting of concrete panels;
 - b. lifting mechanical/electrical equipment on a roof or on the floor of a building;
 - c. lifting of loads encroaching on the public road;
 - d. lifting large dimensionS or very heavy loads;
 - e. all other lifting operation, in accordance with the requirements of the Departmental representative.
- .3 In addition to meeting the above requirements, the Contractor shall plan hoisting operations so as to avoid having loads pass over occupied areas on the site. When this cannot be avoided, the hoisting plan must bear the signature and seal of an engineer, must guarantee the safety of the occupants of this area, and must be approved by the Departmental Representative. If the Departmental Representative deems it necessary, he or she may require that work be performed on evenings and weekends.

- .4 As soon as the work begins on the site, the Contractor shall send the Departmental Representative a list of the hoisting plans covering the entire duration of the work. If any changes are made in the course of the work, this list must be updated accordingly.
- .5 In addition to the certificate of mechanical inspection, all fixed or mobile cranes must have the certificate of annual inspection and the crane's logbook in the cabin.
- .6 The entire hoisting area must be delimited so as to prevent entry by any unauthorized person.
- .7 The Contractor must carefully inspect all slings and hoisting accessories to ensure that any that are in poor condition are destroyed and disposed of.
- .8 Hoisting of compressed gas cylinders must be done with a basket specially designed for this purpose.

MINIMUM CONTENT OF HOISTING PLAN

- Sketch indicating at a minimum, the location of the crane, the surrounding facilities, the zone covered by the hoisting operations, the pedestrian's pathways and vehicular routes, the security perimeter, etc.
- Weight of loads
- DimensionS of loads
- List of hoisting devices and weight of each
- Total weight lifted
- Maximum height of obstacles to clear
- Height of loads lifting relative to the surface of the roof (in the case of loads to be placed on roofs)
- Use of guide cables
- Type of crane used
- Crane capacity
- Boom length
- Boom angle
- Crane's radius of action
- Deployment of stabilizers
- Percentage usage of the crane's capacity

- Verification confirmation of hoisting equipment
- Identification of the crane operator and the person responsible for the hoisting operations with date and signatures

1.36 HOT WORK

- .1 Hot work means any work where a flame is used or a source of ignition may be produced, i.e., riveting, welding, cutting, grinding, burning, heating, etc.
 - .1 Before the beginning of each shift of work and for each sector, the Contractor must obtain a “Hot Work Permit” emitted by the person responsible for the site.
 - .2 A working portable fire extinguisher suitable to the fire risk shall be available and easily accessible within a 5 m radius from any flame, spark source or intense heat.
 - .3 The Contractor must appoint an individual to do continuous monitoring of the fire risks for a period of one (1) hour after the end of the shift of hot work. This individual shall sign the section for this purpose on the permit and give it to the person in charge of the construction site after the one-hour period.
 - .4 When the hot work is done in areas where there is combustible materials or where the walls, ceilings or floors are made of or covered with combustible materials, a final inspection of the work area must be scheduled four (4) hours after the work has finished. Unless specified otherwise by the Departmental representative, the Contractor must assign a person to carry out this monitoring.

Welding and cutting

- .1 In addition to the requirements set out in the preceding paragraphs, the Contractor shall meet the following requirements:
 1. Welding and cutting work must be carried out in accordance with the requirements of the *Code de Sécurité pour les travaux de construction, S-2.1, r.4* (Safety code for the construction industry) and CSA standard W117.2, Safety in Cutting, Welding and Allied Processes.
 2. Air extraction system with filters must be used for all welding and cutting work performed inside.
 3. Stop all activities producing flammable or combustible gas, vapours or dust in the vicinity of the welding or cutting work.
 4. Store all compressed gas cylinder on a fireproof fabric and make sure that the room is well ventilated.
 5. Store all oxygen cylinders more than 6 metres from a flammable gas cylinder (ex: acetylene) or a combustible such as oil or grease, unless the oxygen cylinder is separated from it by a wall made of non-combustible material as mentioned in the article 3.13.4 of the *Code de sécurité pour les travaux de construction, S-2, r. 6* (Safety code for the construction industry)
 6. Store the cylinders far from all heat sources.
 7. Not to store the cylinders close to the staircases, exits, corridors and elevators.
 8. Do not put acetylene in contact with metals such as silver, mercury, copper and alloys of brass having more than 65% copper, to avoid the risk of an explosive reaction.

9. Check that welding equipment with electric arc has the necessary tension and are grounded.
10. Ensure that the conducting wires of the electric welding equipment are not damaged.
11. Place the welding equipment on a flat ground away from the bad weather.
12. Install fireproof canvas when the welding work is done in a superposition and where there is the risk of falling sparks.
13. Move away or protect the combustible materials which are closer than 15 metres from the welding work.
14. Prohibition to weld or cut any closed container.
15. Do not perform any cutting, welding or work with a naked flame on a container, a tank, a pipe or other container containing a flammable or explosive substance unless:
 1. they have been cleaned and air samples indicating that work can be done without danger has been taken; and
 2. provisions to ensure the safety of the workers have been made.

1.37 WORK ON ROOFS

.1 PROTECTION AGAINST FALLS FROM HEIGHTS

- .1 The installation of guardrails is mandatory at all times; however, the installation of warning lines to delimit work areas is permitted, provided that all the requirements of sections 2.9.4.0 and 2.9.4.1 of the *Safety Code for the Construction Industry* are met.
- .2 Guardrails must remain in place until the end of the project. The Departmental Representative shall authorize their dismantling once he or she ascertains that all of the required work, inspections and corrections have been completed.
- .3 Wearing of a safety harness is mandatory for installing safety rails.
- .4 Wearing of a safety harness is mandatory for installing and modifying parapets or flashing, if guardrails have to be moved temporarily.
- .5 Wearing of a safety harness is mandatory for receiving materials and signals by crane at the edge of the building.
- .6 Wearing of a safety harness is mandatory for all work at the edge of the building where collective protection does not provide adequate safety.
- .7 The Contractor shall provide an anchorage system and connecting device that complies with section 2.10.12 of the *Safety Code for the Construction Industry* (CQLR, S-2.1, r. 4) for each sector or work area.

.2 Hoisting of materials

- .1 For all winch installations, the Contractor must submit to the Departmental Representative the manufacturer's recommended installation procedure or, if that is not possible, an installation procedure bearing an engineer's signature and seal. The installation procedure specifically must include the maximum allowable loads, the number, weight and location of the counterweights, and any other details that might affect the device's capacity and stability.
- .2 The Contractor shall carefully inspect all slings and hoisting accessories and ensure that any that are in poor condition are destroyed and disposed of.
- .3 Hoisting of compressed gas cylinders must be done with a basket specially designed for this purpose.

- .4 For any use of a crane or crane truck, the Contractor shall meet the requirements of the “HOISTING LOADS WITH A CRANE OR A CRANE TRUCK” paragraph in the present section.
- .3 Protection against burns
 - .1 Persons working at boilers must wear long sleeves and safety goggles as well as a face screen when loading the boiler.
 - .2 Persons working with tar or other hot liquids must wear gloves, long sleeves and safety goggles.
- .4 Fire protection
 - .1 Propane cylinders must be stored and handled in conformity with standard CAN/CSA-B149.2, *Propane Storage and Handling Code*. Cylinders must be stored outdoors, in a location where they are secure and protected from any unauthorized handling and where there is no vehicular or mobile equipment traffic, unless the cylinders are protected by means of barriers or equivalent devices.
 - .2 The number of propane cylinders on a roof must not exceed that required for one day’s work, and these cylinders must always be secured in a standing position or fastened vertically in a cart designed for this purpose.
 - .3 All hot work (burning, heating, riveting, welding, cutting, moulding, etc.) must be performed in compliance with the “HOT WORK” paragraph in the present section.
- .5 Materials and waste management
 - .1 On the roof, lightweight materials and sheet materials must be stored in containers or firmly secured, failing which the Departmental Representative may prohibit storage of materials on the roof.
 - .2 Waste must be disposed of as it is generated, by means of a waste chute or appropriate containers; the Contractor shall put measures in place to prevent waste from being blown away by the wind.
 - .3 All waste must be removed from the roof at the end of each work shift.
 - .4 Unless special authorization is granted by the Departmental Representative, all waste bins must be positioned at least 3 m from any structure or building.
- .6 Protection of occupants and of the public
 - .1 The Contractor shall install covered passageways, nets or other similar devices at the building's entrances and exits to protect workers, the public and occupants from falling objects. The protection method chosen must be approved by the Departmental Representative.
 - .2 A safety perimeter must be marked out on the ground under the work area to protect workers, the public and occupants.
 - .3 The ground work area, the materials handling area and the area where the boiler is located must be clearly barricaded, to prevent access by occupants and the public.

- .4 Before installing any device that may emit gas or vapours, the Contractor shall obtain authorization from the site manager, who shall ensure that there is no risk of their entering the building's ventilation systems.

1.38 ASSEMBLING AND DISASSEMBLING METAL FRAMEWORKS

- .1 In addition to respecting section 3.24 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry), the Contractor must also respect the requirements described in the following paragraphs.
- .2 Contractor must submit the following documents to the Departmental representative before the beginning of steel structure erection work:
 - .1 erecting procedures in accordance with article 3.24.10 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry);
 - .2 rescue procedures for the release of a worker suspended in a safety harness within a maximum of 15 minutes; procedures must be adapted to the construction site and in accordance with article 3.24.4 of that same code; the procedure must be accompanied by a written confirmation that it has been tested;
 - .3 statement from an engineer that the anchor rods have been installed in accordance with the anchoring plan as required by the article 3.24.12 of that same code;
 - .4 hoisting procedures in cases where the lifting is done in one of the ways described in the article 3.24.15 of that same code;
 - .5 name of the individual identified as rescuer and his rescue training certificate;
 - .6 name of the individual identified as first-aid attendant and his first-aid training certificate.
- .3 The Contractor must make sure that the following documents are available for consultation on construction site at all times:
 - .1 Steel structure manufacturer's erection plan in accordance with the requirements of article 3.24.9 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry);
 - .2 Column anchor rod's anchoring plan in accordance with the requirements of article 3.24.11 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry).

1.39 WORK NEAR A BODY OF WATER

- .1 Not used.

1.40 INDOOR USE OF INTERNAL COMBUSTION MOTORS

- .1 In addition to complying with section 3.10.17 of the *Safety Code for the Construction Industry* (S-2.1, r. 4), the Contractor shall meet the requirements set out in the following paragraphs.

- .2 The use of gasoline-powered equipment inside a building is prohibited, even if the building has openings.
- .3 The use of other equipment having internal combustion motors inside a building shall be subject to the authorization of the Departmental Representative.
- .4 For any use of equipment powered by an internal combustion motor inside a building, even if this building is equipped with openings, the Contractor shall install a ventilation system that can keep the concentrations of toxic gases below the values specified in the applicable regulations. Foul air must be vented outside the building.
 - .1 Before using any equipment powered by an internal combustion motor, the Contractor shall produce a written plan specifying:
 - .2 the number of fans to be installed;
 - .3 the power of the fans;
 - .4 the location of the fans;
 - .5 the dimensions of the openings that will be open during the work.
- .5 While equipment powered by an internal combustion motor is operating, the Contractor shall measure the concentrations of carbon monoxide and nitrogen oxides in the work areas, at the level of the workers' breathing area; the concentrations measured shall be recorded every 30 minutes in a log that is available for consultation.
- .6 If the work is being done in an occupied building, the Contractor shall also measure the concentrations of carbon monoxide and nitrogen oxides every 30 minutes in the facilities adjacent to the work area and note these values in a log.
- .7 If the carbon monoxide or nitrogen oxides detector alarm is triggered while work is in progress, the Contractor shall suspend the work and take the necessary corrective measures before resuming it.
- .8 A portable extinguisher must be available in the work area at all times when equipment powered by an internal combustion motor is in use.
- .9 The equipment must be kept at a safe distance from any combustible material.
- .10 The fuel for equipment powered by internal combustion motors shall not be stored inside a building.

1.41 TEMPORARY HEATING

- .1 In addition to complying with section 3.11 of the *Safety Code for the Construction Industry* (S-2.1, r. 4), the Contractor shall meet the requirements set out in the following paragraphs.
- .2 A portable extinguisher must be available near heating systems at all times, regardless of the type of heating system used.
- .3 The systems must always be used in accordance with the manufacturer's specifications.

- .4 Any tarpaulins used near heating systems must be securely anchored so that they cannot be projected onto these systems, onto the piping connected to these systems or onto any other source of heat.
- .5 Gas cylinders must be installed so as to be protected from vehicular and other equipment traffic.
- .6 For any use of non-electric heating systems, the Contractor shall install a carbon monoxide detector in the work area, close to the systems and/or the workers, for the entire duration of the heating period. If the detector alarm sounds, the Contractor shall make the necessary corrections to the heating facilities immediately.
- .7 The Contractor shall maintain minimal monitoring of heating systems outside of working hours (nights and weekends) and shall submit a monitoring plan to the Departmental Representative before using the heating systems.

1.42 WORK NEAR OVERHEAD ELECTRICAL LINES

- .1 When there is an overhead electrical line in the work area and the Contractor chooses to apply paragraph (b) of section 5.2.2 of the *Safety Code for the Construction Industry* (2.1, r. 4), a copy of the agreement with the electrical power company and a copy of the work plan required by section 5.2.2 (b) must be sent to the Departmental Representative before the start of the work to which those documents pertain.

1.43 UNDERWATER WORK

- .1 Not used.

1.44 OCCUPATIONAL HEALTH AND SAFETY SUBORDINATION AGREEMENT

Project: _____ **Address:** _____

EXTERNAL CONTRACTOR

I hereby agree to submit to the authority of (name of Principal Contractor's business) _____, which is the Principal Contractor for the project indicated above, during the entire duration of our work on the construction site.

Accordingly, I confirm that I have reviewed the Principal Contractor's prevention program, and I agree to:

- inform my employees of the content of the Principal Contractor's prevention program and ensure that its content are complied with at all times;
- provide the prevention program specific to the activities we carry out under this project;
- inform the Principal Contractor of my actions or dealings on the construction site and obtain the Principal Contractor's agreement before the start of work; and
- follow the health and safety directives provided by the representative of the Principal Contractor on the construction site and, depending on requirements, attend training sessions and health and safety meetings organized by the representative of the Principal Contractor.

Name of representative: _____

Name of business: _____

Description of work to be done on the construction site: _____

Approximate dates of work (start-end): _____

Signature: _____ Date: _____

PRINCIPAL CONTRACTOR

I hereby agree to allow (name of external contractor) _____ to perform the work under the project indicated above and, as Principal Contractor, to take the necessary steps to protect the health and safety of workers on the construction site. Should the Contractor repeatedly refuse or fail to comply with my directives, I agree to inform PWGSC's Departmental Representative of this and to provide documentary evidence of my actions or dealings with the Contractor.

Name of representative: _____

Name of the Principal Contractor's business: _____

Signature: _____ Date: _____

Submit a completed and signed copy to PWGSC's Departmental Representative.

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 11 00 - Summary of Work
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 74 11 – Cleaning
- .4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal

1.2 REFERENCE STANDARDS

- .1 *Environment Quality Act (CQLR c. Q-2) and Canadian Environmental Protection Act, 1999, S.C. 1999, c. 33*
- .2 Stormwater Management Guide - MDDELCC

1.3 DEFINITIONS

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

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit manufacturer's instructions, printed product literature and data sheets and WHMIS Safety Data Sheets (SDS) in accordance with Section 01 33 00 - Submittal Procedures and Section 01 35 29.06 - Health and Safety Requirements.
- .2 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan:
 - .1 Names of persons responsible for ensuring adherence to the Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of persons responsible for training site personnel.
 - .4 A description of the environmental protection personnel training program.

- .5 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.
 - .1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.
- .6 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
 - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
- .7 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .9 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
- .10 A contaminant prevention plan identifying potentially hazardous substances to be used on the job site; intended actions to prevent introduction of such materials into the air or ground, and detailing provisions for compliance with federal, provincial and municipal regulations for the storage and handling of these materials.
- .11 Waste Water Management Plan identifying methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

1.5 FIRES

- .1 Fires and burning of rubbish on site not permitted.
- .2 Provide supervision, attendance and fire protection measures as directed.

1.6 DRAINAGE

- .1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .2 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .3 Ensure pumped water into waterways, sewer or drainage systems contains no suspended material greater than 30 mg/L in relation to natural occurring content. The Contractor will be required to obtain a permit in order to discharge water to the City of Montreal's network according to the *Communauté Métropolitaine* of Montreal's water purification regulations (2008-47) and the discharges to the remediation works of the City of Montreal agglomeration Council.

1. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements. Provide a decanting system for drainage water in the site area, r if necessary, and supply the detail of this system prior to commencement of work.

1.7 SITE CLEARING AND PLANT PROTECTION

1. The cutting and relocating of trees to be completed after March 30 will require an assessment by the Departmental Representative to confirm that there are no nests nor nesting birds before allowing work to be undertaken.

1.8 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
 - .1 Provide temporary shelters to prevent dispersal of dust and residue off site and into the air.
- .4 Wet down dry materials and cover waste to prevent blowing dust and debris. Apply a dust control product on temporary access roads.

Environment Canada criteria must be met:

Fine particles (2,5 um)

3 hrs : 35 µg/m3

24 hrs : 30 µg/m3

Total particles

1hrs: 300 µg/m3

8hrs: 190 µg/m3

24 hrs: 120 µg/m3
- .5 For the prevention of noise pollution, the contractor will have to respect the following sound criteria during the work.
 - .1 The site area is called a noise sensitive area. The noise levels not to be exceeded outside are:
 - .1 7h à 19h :
 - .1 L10 : 75 dBa / Ambient noise 5 (1)
 - .2 LMAX : 85-95 dBa For an impact start (2)

(1) The highest of of both levels becomes the sound level not to be exceeded

(2) Impact noise is an intermittent noise, the intensity of which rises rapidly.

L10 measured, is the average over a period of thirty (30) minutes.

Measured LMAX represents the maximum value of a sound emission. The measurement time is usually one second.

1.9 HISTORICAL/ARCHAEOLOGICAL CONTROL

- .1 Not Used.

1.10 NOTIFICATION

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

1.11 MITIGATION MEASURES

- .1 Air quality and sound environment:
 - .1 Use machinery and equipment in good working order;
 - .2 Do not leave machinery running when not in use;
 - .3 Place noisy equipment away from sensitive areas for example building windows.
 - .4 Workers must wear protective equipment adapted to this type of work (protective eyewear, respiratory protective device and appropriate clothing);
 - .5 Confine the work area with temporary screens or tarpaulins during grinding work in order to limit the spread of dust and protect the surrounding works;
 - .6 Clean the premises and recover the dust after the Grinding of surfaces;
- .2 Concrete Paving Works:
 - .1 Workers must wear protective equipment suitable for type of work (protective eyewear, respirators and appropriate clothing);
 - .2 Enclose the Work area with temporary screens or tarpaulins during sand-blasting to contain dust and protect nearby works;
 - .3 Clean Work area and recover dust after sandblasting;
- .3 Water quality

- .1 If waterblasting is planned, before spraying, clean surface with a mechanical sweeper or steel brushes, etc., to remove as much debris, sand, dust and other materials as possible;
- .2 Do not use solvents or other chemical products for cleaning;
- .3 Do not dispose of contaminated water into storm or sanitary sewers;
- .4 Wash water containing substances such as soap or non-hazardous cleaning solutions may be discharged into sanitary sewers. Install barriers to protect nearby works, pedestrians and cyclists during spraying.
- .4 Risk of accident or breakdown
 - .1 Do not perform maintenance on motorized equipment on site;
 - .2 If required on site, carefully handle and store petroleum products at least 30 metres from sewer intakes or stormwater discharge channels;
 - .3 Fuel machinery on paved or nonporous surfaces, where a possible spill can easily be recovered;
 - .4 Immediately clean up any spills on the ground, no matter how small;
 - .5 Provide for the presence on site of a spill kit: absorbents, sealed containers, etc.;
 - .6 If a spill occurs, immediately apply emergency measures to control the spill and deal with the cause (breakage, mishandling, etc.). Contain the leak, clean the contaminated area and transport contaminated materials to an authorized site. Contact environmental emergency services. ENVIRONMENT CANADA: 1-866-283-2333 and Urgence Québec: 1-866-694-5454

Partie 2 Products

2.1 NOT USED

- .1 Not Used.

Partie 3 Execution

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section [01 74 00 - Cleaning].
 - .1 Leave Work area clean at end of each day.
- .2 Bury rubbish and waste materials on site where directed after receipt of written approval from [Consultant] [DCC Representative] [Departmental Representative].
- .3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 00 - Cleaning].

- .5 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section [01 74 19 - Waste Management and Disposal] [01 35 21 - LEED Requirements].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

1.2 RELATED REQUIREMENTS

- .1 Not used.

1.3 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with National Building Code of Canada (2015), including amendments up to tender closing date, that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.4 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

1.5 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.

1.6 NATIONAL PARKS ACT

- .1 Perform Work in accordance with National Parks Act when projects are located within boundaries of National Park.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: Except as otherwise specified, [Constructor] shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
 - .1 Regulatory requirements and fees in force on date of Bid submission, and
 - .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

Part 2 Products

2.1 PERMITS

- .1 Section 01 14 00 – Work restrictions

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures

1.2 REFERENCE STANDARDS

- .1 Not used.

1.3 INSPECTION

- .1 Allow the Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by the Departmental Representative's instructions, or according to the law of the Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 The Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 Not used.

1.5 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.6 PROCEDURES

- .1 Notify the appropriate agency and the Departmental Representative in advance of requirement for tests, so that attendance arrangements may be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.7 REJECTED WORK

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

1.8 REPORTS

- .1 Provide two (2) copies of testing and inspection reports to the Departmental Representative.
- .2 Provide copies of these reports to sub-contractors responsible for inspected or tested work.

1.9 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by the law of the Place of Work will be evaluated by the Departmental Representative and may be authorized as recoverable.

1.10 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, the Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to the Departmental Representative.
- .7 Mock-ups may remain as part of Work.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.11 MILL TESTS

- .1 Submit mill test certificates as required in specification Sections.

1.12 EQUIPMENT AND SYSTEMS

- .1 Not used.

Partie 2 Products

2.1 NOT USED

- .1 Not used.

Partie 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures

1.2 REFERENCE STANDARDS

- .1 CCDG (Book of General Specifications) and amendments.
- .2 MTMDDET Standards – Road Structures Volume V
- .3 Standard Specifications “*Maintien de la circulation, signalisation temporaires et gestion des impacts*” 2014 edition, City of Montreal

1.3 PROTECTION OF PUBLIC TRAFFIC

- .1 Before the start of Work, the Contractor must submit a complete signage plan to the Departmental Representative. This plan must comply with the requirements of the CCDG (Book of General Specifications) and amendments and MTMDDET Standards – Road Structures Volume V and of the Standard Specifications “*Maintien de la circulation, signalisation temporaires et gestion des impacts*” 2014 edition, City of Montreal.
- .2 The traffic management plan must be signed and sealed by an engineer, member of the Ordre des Engineers du Québec, and approved by the Departmental Representative before the start of Work.
- .3 Provide for a period of seven (7) working days for the examination of the workshop drawings by the Departmental Representative.
- .4 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .5 Close road lanes only after receipt of written approval from the Departmental Representative.
- .6 Before rerouting traffic, install appropriate signage in accordance with the requirements of the CCDG (Book of General Specifications) and amendments and MTMDDET Standards – Road Structures Volume V and of the Standard Specifications “*Maintien de la circulation, signalisation temporaires et gestion des impacts*” 2014 edition, City of Montreal.
- .7 Keep travelled way graded, free from pot holes and of sufficient width for required number of lanes of traffic.
 - .1 Provide 7-m wide minimum temporary roadway for traffic in two-way sections through Work and on detours.
 - .2 Provide 5-m wide minimum temporary roadway for traffic in one-way sections through Work and on detours.

- .8 When required, and as directed by the Departmental Representative, provide gravelled detours or temporary roads to facilitate passage of traffic around restricted construction area.
- .9 Provide and maintain road access to property fronting along Work under Contract and in other areas as indicated, except where other means of road access exist that meet approval of the Departmental Representative.

1.4 INFORMATIONAL AND WARNING DEVICES

- .1 Provide, install and maintain signs required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 Provide and install signage, delineators, barricades and other warning devices, in accordance with the requirements of the CCDG (Book of General Specifications) and amendments and MTMDet Standards – Road Structures Volume V and of the Standard Specifications ‘*Maintien de la circulation, signalisation temporaires et gestion des impacts*’ 2014 edition, City of Montreal.
- .3 Position signage and other devices in the recommended locations in accordance with the CCDG (Book of General Specifications) and amendments and MTMDet Standards – Road Structures Volume V.
- .4 Meet with the Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise the Departmental Representative’s list.
- .5 Continually maintain traffic control devices in use:
 - .1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
 - .2 Remove or cover signs which do not apply to conditions existing from day to day.

1.5 CONTROL OF PUBLIC TRAFFIC

- .1 Ensure the presence, on site, of traffic control persons whose training and equipment comply with the CCDG (Book of General Specifications) and amendments and MTMDet Standards – Road Structures Volume V, for the following situations:
 - .1 When public traffic is required to pass working vehicles or equipment that block all or part of travelled roadway.
 - .2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
 - .3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
 - .4 Where temporary protection is required while other traffic control devices are being erected or taken down.

- .5 For emergency protection when other traffic control devices are not readily available.
- .6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
- .7 At each end of restricted sections where pilot cars are required.
- .8 Public traffic may not be interrupted at any time.
- .2 Where roadway, carrying two-way traffic, is restricted to one lane, for 24 hours each day, provide portable traffic signal system.
 - .1 Adjust, as necessary, and regularly maintain system during period of restriction.Ensure that the light signal system used meets the requirements of the CCDG (Book of General Specifications) and amendments and MTMDDET Standards – Road Structures Volume V and of the Standard Specifications '*Maintien de la circulation, signalisation temporaires et gestion des impacts*' 2014 edition, City of Montreal.

1.6 OPERATIONAL REQUIREMENTS

- .1 Maintain existing conditions for traffic throughout period of Contract. However, when required for construction under contract and when measures have been taken as specified and approved by the Departmental Representative to protect and control public traffic, existing conditions for traffic may be restricted. Changes must be submitted to the Departmental Representative for approval.
- .2 Maintain existing conditions for traffic crossing right-of-way.
- .3 Maintain existing conditions for traffic crossing right-of-way except when required for construction. With approval of the Departmental Representative, existing conditions for cross traffic may be restricted. Changes must be submitted to the Departmental Representative for approval.

1.7 PERMIS D'OCCUPATION DU DOMAINE PUBLIC

- .1 The contractor must obtain a licence to occupy the public domain in accordance with standard specifications '*Maintien de la circulation, signalisation temporaires et gestion des impacts*' 2014 edition, City of Montreal.
- .2 The Contractor must respect the time limits as well as the work areas which are allowed for him to occupy as stated in the above mentioned license agreed upon with the borough concerned.

Partie 2 Products

2.1 NOT USED

- 1. The signaling devices must be new at the time of installation and in compliance with the standards and must be kept in new condition for the duration of the work. Signaling devices must be cleaned regularly and stored so as to maintain the required reflectivity.

Partie 3	Execution
3.1	NOT USED
.1	Not Used.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 11 00 – Summary of Work
- .2 Section 01 35 43 – Environmental Protection
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.2 REFERENCES

- .1 Not used.

1.3 SUBMITTAL PROCEDURES

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit site plan to the Departmental Representative for approval before start of construction.
- .3 Provide shop drawings detailing enclosures. Propose fence lines for review and approval by the Departmental Representative no later than five (5) days after contract award.
- .4 Provide shop drawings and a written plan for protection of masonry wall and adjacent buildings for review and approval by the Departmental Representative, including how such protection is to be implemented and the materials required.

1.4 INSTALLATION AND REMOVAL

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

1.5 CONSTRUCTION SITE FENCING

- .1 Provide and maintain a secure galvanized steel construction site fencing, rigid, continuous fence around the construction site as indicated in the Contract Documents.
- .2 Around the site, erect a temporary modular fence, construction fence panels to be galvanized steel mesh. The modular panels, nominally 2.438 mm high, are composed of 16-gauge galvanized-steel tubular sections and 6-gauge galvanized-steel mesh welded to tubular sections. The fence rests flush with the ground and supported on a modular and elevated galvanized steel base. Attach semi-transparent green membrane to galvanized steel mesh to reduce the emission of dust and minimize the visual impact of the fence surrounding the site and the storage area.
- .3 Fence must be in good condition and uniform colour.
- .4 Install one (1) lockable gate for machinery and personnel, as indicated in the Contract Documents; follow traffic restrictions for adjacent streets. Leave gates unobstructed to allow free movement of vehicles. and vehicles are not to be parked near the construction site. Provide the Departmental Representative with a duplicate set of keys.

- .5 When installing fencing, ensure sufficient space is left to allow access from all sides to vehicles parked nearby and to prevent damage.
- .6 The Contractor is solely responsible for the security of the job site, including taking all reasonable measures to prevent unauthorized access and protect the public.

1.6 ACCESS TO SITE

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
- .2 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.

1.7 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent flag operators, traffic signals, barricades and flares, lights or lanterns as required to perform Work and protect public.
- .2 If the work site blocks the pedestrian crossing, a safe bypass route must be appropriately signed and additional fencing installed, if necessary.

1.8 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.10 PROTECTION OF BUILDING FINISHES

- .1 Construction activities must be managed, ordered, planned and executed so as to prevent damage to specific building features.
- .2 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .3 Provide necessary screens, covers and hoardings.
- .4 Confirm with the Departmental Representative locations and installation schedule three (3) days prior to installation.
- .5 Be responsible for damage incurred due to lack of or improper protection.

1.11 WASTE MANAGEMENT AND DISPOSAL

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

1.12 SPECIAL REQUIREMENT

- .1 Heavy equipment and machinery may not be operated on the existing concrete slab. The Contractor shall carry out the Work without operating vehicles on the slab.
- .2 The unfactored maximum construction load is 6 kPa.

Partie 2 Products

2.1 NOT USED

- .1 Not used.

Partie 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 11 00 – Summary of Work
- .2 Section 01 35 43 – Environmental Protection
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.2 REFERENCES

- .1 Not used.

1.3 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by the Departmental Representative or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from premises. Remove snow from site.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.4 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than those produced by the Departmental Representative or other Contractors.
- .5 Clean and polish glass, hardware and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .6 Clean equipment and fixtures; clean or replace filters of mechanical equipment.
- .7 Remove stains, spots, marks and dirt from decorative work and electrical and mechanical fixtures.
- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .11 Remove dirt and other disfiguration from exterior surfaces.
- .12 Clean roofs, downspouts, and drainage systems.
- .13 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .14 Clean signage panels.
- .15 The Contractor shall clear snow from the work site in a manner approved by the Departmental Representative. Snow may be stored inside the work site may be permitted provided that access is cleared for security forces vehicles moving outside the fenced-off area. Obstructing visibility through the fence constitutes a security deficiency and must be addressed immediately. The Departmental Representative may issue a stop-work order until satisfactory corrective action is taken.
- .16 Remove snow and ice from access to work site. Do not store snow outside the site at any time.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

Partie 2 Products

2.1 NOT USED

- .1 Not used.

Partie 3	Execution
3.1	NOT USED
.1	Not used.

END OF SECTION

Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 11 00 – Summary of Work
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 35 43 – Environmental Protection
- .4 Section 01 74 11 – Cleaning

1.2 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with the Departmental Representative to review and discuss PWGSC's waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2 PWGSC's waste management goal: to divert a minimum 75 percent of total Project Waste from landfill sites. Prior to project completion provide the Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced. The overall waste diversion goal for this project is 75%.
- .3 Target percentage goals are achievable for waste diversion.
- .4 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .5 Protect environment and prevent environmental pollution damage.

1.3 DEFINITIONS

- .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.
- .2 Class III: non-hazardous waste - construction renovation and demolition waste.
- .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities
- .4 Inert Fill: inert waste - exclusively asphalt and concrete.
- .5 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .6 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .7 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

- .8 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .9 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .10 Separate Condition: refers to waste sorted into individual types.
- .11 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .12 Waste Diversion Report: detailed report of final results, quantifying cumulative weights and percentages of waste materials reused, recycled and landfilled over course of project. Measures success against Waste Reduction Workplan (WRW) goals and identifies lessons learned.
- .13 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.
- .14 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities.
- .15 Canadian Construction Association (CCA)
 - .1 CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.
- .16 Public Works and Government Services Canada (PWGSC)
 - .1 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol (2002).

1.4 DOCUMENTS

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
 - .1 Waste Reduction Workplan (Schedule B).

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
 - .1 One (1) copy and one (1) electronic copy of completed Waste Reduction Workplan (WRW): Schedule B.
- .3 Prepare and submit on bi-weekly basis, throughout project or at intervals agreed to by the Departmental Representative the following:

- .1 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.
- .4 Submit prior to final payment the following:
 - .1 Waste Diversion Report, indicating final quantities by material types salvaged for reuse, recycling or disposal in landfill and recycling centres, re-use depots, landfills and other waste processors that received waste materials.
 - .2 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.6 WASTE REDUCTION WORKPLAN (WRW)

- .1 Prepare and submit WRW (Schedule B) at least ten (10) days prior to project start-up.
- .2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations, based on information acquired from WA.
- .3 WRW should include but not limited to:
 - .1 Applicable regulations.
 - .2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.
 - .3 Destination of materials identified.
 - .4 Deconstruction/disassembly techniques and schedules.
 - .5 Methods to collect, separate, and reduce generated wastes.
 - .6 Location of waste bins on-site.
 - .7 Security of on-site stock piles and waste bins.
 - .8 Protection of personnel, sub-contractors.
 - .9 Clear labelling of storage areas.
 - .10 Training plan for contractor and sub-contractors.
 - .11 Details on materials handling and removal procedures.
 - .12 Recycler and reclaimer requirements.
 - .13 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.
 - .14 Requirements for monitoring on-site wastes management activities.
- .4 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .5 Post WRW or summary where workers at site are able to review content.
- .6 Monitor and report on waste reduction by documenting total volume (in tonnes) of actual waste removed from project.

1.7 USE OF SITE AND FACILITIES

- .1 Execute Work with minimal interference and disturbance to normal use of premises.

- .2 Maintain security measures established by facility. Implement temporary security measures approved by the Departmental Representative.

1.8 WASTE PROCESSING SITES

- .1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

1.9 QUALITY ASSURANCE

- .1 After award of Contract, a mandatory site examination will be held for this Project for the Contractor responsible for construction, renovation demolition/deconstruction waste management.
 - .1 Date, time and location will be arranged by the Departmental Representative.
- .2 Waste Management Meeting: Waste Management Co-ordinator is to provide an update on status of waste diversion and management activities at each meeting. Written monthly Waste Diversion Report summary to be provided by Waste Management Coordinator.

1.10 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by the Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed and salvaged materials from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify the Departmental Representative.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .9 Separate and store materials produced during project in designated areas.
- .10 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off site processing facility for separation.
 - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
 - .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.11 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total quantity (m³) of waste generated.
 - .4 Total quantity (m³) of waste reused or recycled.
 - .5 Reused or recycled waste destination.
- .4 Remove and dispose of materials as Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis.

1.12 SCHEDULING

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

Partie 2 Products

2.1 NOT USED

- .1 Not used.

Partie 3 Execution

3.1 GENERAL

- .1 Do Work in compliance with WRW.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.
- .3 Remove unused paint materials to the official hazardous materials collection site as approved by the Departmental Representative. Do not dispose of unused paint or coating materials into sewers, streams, lakes, onto the ground or in places where they may pose a health or environmental hazard.
- .4 Place excess or unused insulating materials and insulation accessories in the designated containers.
- .5 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

- .6 Remove unused adhesive materials to the official hazardous materials collection site as approved by the Departmental Representative.
- .7 Divert plastic packaging, bindings and containers/materials from landfill to a plastic recycling facility as approved by the Departmental Representative.
- .8 Remove unused fertilizer to the official hazardous materials collection site as approved by the Departmental Representative.
- .9 Remove unused anti-desiccants to the official hazardous materials collection site as approved by the Departmental Representative.
- .10 Divert unused wood and mulch materials from landfill to recycling facility as approved by the Departmental Representative.
- .11 Divert unused concrete to local quarry following written approval from the Departmental Representative.
- .12 Arrange a suitable area on site where concrete mixing trucks may be safely washed.
- .13 Divert unused admixtures and additives (pigments, fibres) to official hazardous materials collection sites as approved by the Departmental Representative. Do not dispose of unused admixtures and additive into sewers, lakes, streams, onto the ground or in places where they may pose a health or environmental hazard.
- .14 Prevent admixtures and additives from entering drinking water supplies or streams.
- .15 Using appropriate safety precautions, collect liquids or solidify liquids with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, provincial and federal regulations.

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.
- .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 this Section.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by the Departmental Representative, and consistent with applicable fire regulations.
 - .1 Mark containers.
 - .2 Provide instruction on disposal practices.

- .2 On-site sale of recovered waste material for reuse/recycling is not permitted.

3.4 WASTE DIVERSION REPORT

- .1 At completion of Project, prepare written Waste Diversion Report indicating quantities of materials reused, recycled or disposed of as well as the following:
- .1 Identify final diversion results and measure success against goals from Waste Reduction Workplan.
 - .2 Compare final quantities/percentages diverted with initial projections in Waste Reduction Workplan. Explain variations.
 - .1 Supporting documentation.
 - .2 Waybills and tracking forms.
 - .3 Description of issues, resolutions and lessons learned.

3.5 WASTE REDUCTION WORKPLAN (WRW)

- .1 Schedule B

1) Material Category	2) Persons Responsible	3) Total Quantity of Waste (unit)	4) Reused Amount (units) Projected	Actual	5) Recycled Amount (unit) Projected	Actual	6) Materials Destination
Concrete							
Plastic parts and packaging							
Warped Pallet Forms							
Cardboard Packaging							
Metal							
Wood							
Mulch							
Insulation							
Adhesive materials							
Admixtures and additives							
Paint							
Fertilizer, etc.							

3.6 FEDERAL AND PROVINCIAL GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule G - Government Chief Responsibility for the Environment:

<i>Province</i>	<i>Address</i>	<i>General Inquiries</i>	<i>Fax</i>
Quebec	Ministère de l'Environnement et de la Faune, siège social 150, boul. René-Lévesque Est, Québec (QC) G1R 4Y1	418-643-3127 1-800-561-1616	418-646-5974
	Ministère du Développement durable, de l'Environnement et de Lutte contre les changements climatiques (MDDELCC) 675 Boul. René Lévesque Québec, (QC) G1R 5V7	418-521-3820 1-800-561-1616 EMERGENCY: 1-866-694-5454	
	Conseil de la conservation et de l'environnement 800 Place d'Youville, 19e étage Québec (QC) G1R 3P4	EMERGENCY: 418-643-3818	

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 45 00 – Quality Control.
- .3 Section 01 78 00 – Closeout submittals.

1.2 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.
 - .2 DOC 14-2000, Design-Build Stipulated Price Contract.
 - .3 DOC 15-2000, Design-Build/Consultant Contract.
- .2 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor shall conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Departmental Representative's inspection.
 - .2 Departmental Representative's Inspection:
 - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English and French that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, balanced and fully operational.
 - .4 Certificates required by Utility companies: submitted.
 - .5 Operation of systems: demonstrated to Owner s personnel.

- .6 Commissioning of mechanical systems: completed in accordance with Departmental Representative.
- .7 Work: complete and ready for final inspection.
- .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.
 - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner s acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 Refer to CCDC 2 : when Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.4 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

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 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures.
- .2 Section 01 45 00 – Quality Control.

1.2 REFERENCE STANDARDS

- .1 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with Departmental Representative, in accordance with :
 - .1 Verify Project requirements.
 - .2 Review warranty requirements and manufacturer's instructions.
 - .2 Departmental Representative to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two (2) weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four (4) final copies of operating and maintenance manuals in English and French.
- .3 The materials and replacement material, special tools and spare parts supplied must be of the same quality of manufacture as the products used for the performance of the work.
 - 1. Provide inventory of the list of operating and maintenance manuals.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.5 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 D ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
 - .1 Identify contents of each binder on spine.
- .4 On the cover page of each binding, the description of the document, i.e. "project file", typed or marked in print, the project description and the table of contents should be indicated.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer s printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

1.6 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.7 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:

- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Change Orders and other modifications to Contract.
- .5 Reviewed shop drawings, product data, and samples.
- .6 Field test records.
- .7 Inspection certificates.
- .8 Manufacturer s certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document PROJECT RECORD in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings and in copy of Project Manual, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:

- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
- .2 Changes made by Addenda and change orders.
- .6 At the end of the project and before the final inspection, carefully transfer the annotations to a second set of drawings and specifications (specifications). Submit both sets to the department's representative.
- .7 Other documents: Keep manufacturer's certificates, inspection certificates and on-site test registers as prescribed in each of the technical sections of the quotation.
- .8 Provide digital photos, if requested, for site records.

1.9 FINAL SURVEY

- 1. Submit the final survey certificate attesting to the compliance or non-compliance with the requirements of the contract Documents of the site and the level ratings of the completed works.

1.10 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 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.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer s printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer s parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination 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 as specified in Section 01 45 00 - Quality Control.
- .15 Additional requirements: as specified in individual specification sections.

1.11 MATERIALS AND FINISHES

- .1 Building materials, finishing products and other products to be applied: provide the datasheets and indicate the catalogue number, dimensions, composition and designations of the colours and textures of the products and materials.
 - 1. For replenishment, provide the necessary information regarding special products.
- .2 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.
- .3 Additional requirements: as specified in individual specifications sections.

1.12 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed ; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver and store materials/replacement material at the specified location by the Department's representative.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.

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

1.13 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer s seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Evacuate damaged or deteriorated items or products, replace them with new ones at no additional cost, and submit them to the Departmental representative for review.

1.14 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within [ten] days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner s permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

- .8 Conduct joint four (4) month and nine (9) month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 The list and status of guarantee certificates for items and lots subject to prolonged warranties such as synthetic surfaces and artificial turf, metal fencing, gaming equipment, benches, trees and Other equipment.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
 - .4 Contractor s plans for attendance at four (4) and nine (9) month post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.
 - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

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 RELATED REQUIREMENTS

- .1 Section 01 91 13 - General Commissioning Requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.
- .2 Owner: Provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation.
 - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning Requirements, and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, and troubleshooting at the designated equipment.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: Ensure amount of time required for instruction of each item of equipment or system as follows:
 - .1 Sections 26 05 20 to 26 28 16.02 (Electrical Distribution): 4 hours.
 - .2 Section 26 50 00 (Lighting): 8 hours.
 - .3 Section 26 50 00 (Digital Screen): 8 hours.
 - .4 Section 28 13 00 (Access Control) : 8 hours.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.4 QUALITY ASSURANCE

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
 - .1 Instruct Owner's personnel.
 - .2 Provide written report that demonstration and instructions have been completed.

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 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Related Requirements
 - .1 Section 01 91 13.13 - Commissioning Plan.
 - .2 Section 01 91 13.16 - Commissioning Forms.
- .3 Acronyms:
 - .1 AFD - Alternate Forms of Delivery, service provider.
 - .2 BMM - Building Management Manual.
 - .3 Cx - Commissioning.
 - .4 EMCS - Energy Monitoring and Control Systems.
 - .5 O&M - Operation and Maintenance.
 - .6 PI - Product Information.
 - .7 PV - Performance Verification.
 - .8 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

- .3 Design Criteria: As per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

- .1 Section 01 91 13.13 - Commissioning (Cx) Plan.
- .2 For Cx responsibilities refer to Section 01 91 13.13- Commissioning (Cx) Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .6 Departmental Representative will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review Contract Documents: Confirm by writing to Departmental Representative.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location, and installation of provisions for Cx.

- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.
 - .5 Understand completely design criteria and intent and special features.
 - .6 Submit complete start-up documentation to Departmental Representative.
 - .7 Have Cx schedules up-to-date.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
 - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit no later than 4 weeks after award of Contract:
 - .1 Name of Contractor's Cx agent.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.8 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 13.16 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.

- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

1.9 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.10 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings: Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60 % construction completion stage. Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart. Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60 % and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.12 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.
- .2 Departmental Representative to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Departmental Representative.
 - .3 Arrange for Departmental Representative to witness tests.
 - .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing, and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: Follow accepted start-up procedures.

- .3 Operational testing: Document equipment performance.
- .4 System PV: Include repetition of tests after correcting deficiencies.
- .5 Post-substantial performance verification: To include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: Implement corrective measures approved by Departmental Representative.
 - .2 Major equipment/systems: If evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
 - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
- .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports,
 - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate, and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

- .1 Submit to Departmental Representative for review and approval:
 - .1 Complete list of instruments proposed to be used.
 - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date, and calibration accuracy.
- .2 Provide the following equipment as required:
 - .1 2-way radios.
 - .2 Ladders.
 - .3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx:
 - .1 Under actual operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

- .1 Departmental Representative to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.23 COMMISSIONING CONSTRAINTS

- .1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, sensitive equipment and systems in these areas before issuance of the Interim Certificate.

1.24 EXTENT OF VERIFICATION

- .1 Architectural lighting systems, lighting, digital screen, and retractable protection bollards:
 - .1 Provide manpower and instrumentation to verify up to 10 % of reported results.
- .2 Elsewhere:
 - .1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.
- .3 Number and location to be at discretion of Departmental Representative.
- .4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .5 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .6 Perform additional commissioning until results are acceptable to Departmental Representative.

1.25 REPEAT VERIFICATIONS

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive Departmental Representative's approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 Departmental Representative deems Contractor's request for second verification was premature.

1.26 SUNDRY CHECKS AND ADJUSTMENTS

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

1.27 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.

- .2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.28 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.29 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.30 TRAINING

- .1 In accordance with Section 01 79 00 - Demonstration and Training.

1.31 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools, as specified in contract.

1.32 OCCUPANCY

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

1.33 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data if sensor calibration has been completed and accepted.

1.34 PERFORMANCE VERIFICATION TOLERANCES

- .1 Application Tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within $\pm 10\%$ of specified values.
- .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.

- .3 Measurement tolerances during verification:
 - .1 Unless otherwise specified actual values to be within $\pm 2\%$ of recorded values.

1.35 OWNER'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

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 Section Includes:
 - .1 Description of overall structure of Plan and roles and responsibilities of commissioning team.
- .2 Related Requirements
 - .1 Section 01 91 13 - General Commissioning Requirements.

1.2 REFERENCE STANDARDS

- .1 Public Works and Government Services Canada (PWGSC).
 - .1 PWGSC - Commissioning Guidelines CP.4 -3rd Edition-03.
- .2 Underwriters' Laboratories of Canada (ULC).

1.3 GENERAL

- .1 Provide a fully functional facility:
 - .1 Systems, equipment, and components meet user's functional requirements before date of acceptance and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 Facility user and O&M personnel have been fully trained in aspects of installed systems.
 - .3 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O&M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet Owner's requirements.
 - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
 - .1 Overview of Cx.
 - .2 General description of elements that make up Cx Plan.

- .3 Process and methodology for successful Cx.
- .4 Acronyms:
 - .1 Cx - Commissioning.
 - .2 BMM - Building Management Manual.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 SDS - WHMIS Safety Data Sheets.
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.
 - .7 TAB - Testing, Adjusting, and Balancing.
 - .8 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
 - .1 Bumping: Short-term start-up to prove ability to start and prove correct rotation.
 - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.4 DEVELOPMENT OF 100% CX PLAN

- .1 Cx Plan to be 95% completed before added into Project Specifications.
- .2 Cx Plan to be 100% completed within 8 weeks of award of contract to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
- .3 Submit completed Cx Plan to Departmental Representative and obtain written approval.

1.5 REFINEMENT OF CX PLAN

- .1 During construction phase, revise, refine and update Cx Plan to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update every 6 weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
- .3 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
- .4 PWGSC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.
 - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .3 Protection of health, safety and comfort of occupants and O&M personnel.
 - .4 Monitoring of Cx activities, training, development of Cx documentation.
 - .5 Work closely with members of Cx Team.
- .5 Departmental Representative is responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Developing BMM.
 - .6 Ensuring implementation of final Cx Plan.
 - .7 Performing verification of performance of installed systems and equipment.
 - .8 Implementation of Training Plan.
- .6 Construction Team: Contractor, subcontractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with and PWGSC Cx Manager for administrative and coordination purposes.
- .7 Contractor's Cx agent implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.

- .4 Preparation, submission of test reports.
- .8 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.
 - .2 Day-To-Day operation and maintenance of facility.

1.7 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
 - .2 Equipment manufacturer: Equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
 - .3 Specialist subcontractor: Equipment and systems supplied and installed by specialist subcontractor.
 - .4 Specialist Cx agency:
 - .1 Possessing specialist qualifications and installations providing environments essential to client's program, but are outside scope or expertise of Cx specialists on this project.
 - .5 Client: responsible for intrusion and access security systems.
 - .6 Ensure that Cx participant:
 - .1 Could complete work within scheduled time frame.
 - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:
 - .1 Redistribution and modification of electrical services.
 - .2 Installation of lighting control and equipment.
 - .3 Installation of digital screen panel.
 - .7 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

1.8 EXTENT OF CX

- .1 Commission Electrical Systems and Equipment:
 - .1 Low voltage below 750 V:
 - .1 Low voltage equipment.

- .2 Low voltage distribution systems.
- .2 Lighting systems:
 - .1 Lighting equipment.
 - .2 Distribution systems.
 - .3 Control systems.
- .3 Other systems and equipment:
 - .1 Digital screen panel, controls, and electrical distribution.
 - .2 Retractable protection bollards (access control).

1.9 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements:
 - .1 Compile French and English documentation.
 - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
 - .1 Warranties.
 - .2 Project record documentation.
 - .3 Inventory of spare parts, special tools and maintenance materials.
 - .4 Maintenance Management System (MMS) identification system used.
 - .5 WHMIS information.
 - .6 WHMIS Safety Data Sheets (SDS).
 - .7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.10 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing, and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.

- .3 Completed installation checklists (ICL).
- .4 Completed product information (PI) report forms.
- .5 Completed performance verification (PV) report forms.
- .6 Results of Performance Verification Tests and Inspections.
- .7 Description of Cx activities and documentation.
- .8 Description of Cx of integrated systems and documentation.
- .9 Tests of following witnessed by PWGSC Design Quality Review Team:
 - .1 Lighting control system and luminaires.
 - .2 Digital screen panel.
 - .3 Electrical distribution modification.
- .10 Tests performed by Owner/User.
- .11 Training Plans.
- .12 Cx Reports.
- .13 Prescribed activities during warranty period.
- .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: By Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.
 - .2 Departmental Representative to use approved check lists.
 - .3 Departmental Representative will monitor all of these pre-start-up inspections.
 - .4 Include completed documentation with Cx report.
 - .5 Conduct pre-start-up tests: Conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
 - .6 Departmental Representative will monitor some of these inspections and tests.
 - .7 Include completed documentation in Cx report.
- .2 Pre-Cx activities - ELECTRICAL:
 - .1 Low voltage distribution systems under 750 V:
 - .1 Requires independent testing agency to perform pre- energization and post-energization tests.
 - .2 Megger test on all conductors and cables.

- .2 Lighting systems:
 - .1 Architectural lighting and controls:
 - .1 Schedule scenes to make the system and all devices work properly.
 - .3 Digital screen system.
 - .1 Program display scenarios to test all modules by varying unwinding speed, color, and intensity.
 - .2 Perform measurements to confirm system performance.

1.12 START-UP

- .1 Start up components, equipment, and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
 - .1 Electrical distribution.
 - .2 Architectural lighting system.
 - .3 Digital screen panel.
- .3 Departmental Representative to monitor all of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .4 Performance Verification (PV):
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to Departmental Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 Departmental Representative to witness and certify reported results using approved PI and PV forms.
 - .4 Departmental Representative to approve completed PV reports and provide to Departmental Representative.
 - .5 reserves right to Departmental Representative will verify up to 30% of reported results at random.
 - .6 Failure of randomly selected item must result in rejection of PV report or report of system startup and testing.

1.13 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed by Departmental Representative and approved by Departmental Representative.
- .2 Departmental Representative to monitor Cx activities.

- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .4 Departmental Representative to witness, certify reported results of, Cx activities and forward to Departmental Representative.
- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.14 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed by specified Cx specialist, using procedures developed by Departmental Representative and approved by Departmental Representative.
- .2 Tests to be witnessed by Departmental Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Departmental Representative and submitted for review.
- .4 Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
 - .1 Architectural lighting system.
 - .2 Digital screen panel.
- .6 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance Departmental Representative, Contractor, and Cx Manager to co-operate to complete inventory data sheets and provide assistance to PWGSC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.15 INSTALLATION CHECK LISTS (ICL)

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.16 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.17 PERFORMANCE VERIFICATION (PV) REPORT

- .1 Refer to Section 01 91 13.16- Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.18 CX SCHEDULES

- .1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Pre-TAB review: 28 days after award of Contract, and before construction starts.
 - .3 Cx agents' credentials: 60 days before start of Cx.
 - .4 Cx procedures: 3 months after award of Contract.
 - .5 Cx Report format: 3 months after award of Contract.
 - .6 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
 - .7 Notification of intention to start Cx: 14 days before start of Cx.
 - .8 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
 - .9 Identification of deferred Cx.
 - .10 Implementation of training plans.
 - .11 Cx reports: Immediately upon successful completion of Cx.
 - .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.
 - .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

1.19 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by Departmental Representative to Departmental Representative who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.20 PRELIMINARY AND FINAL CX

- .1 Perform preliminary commissioning to ensure proper operation of all systems.
- .2 When all systems are functional, proceed to final commissioning.

1.21 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Adjustment of luminaires and projectors.

1.22 TESTS TO BE PERFORMED BY OWNER/USER

- .1 None is anticipated on this project.

1.23 TRAINING PLANS

- .1 Refer to Section 01 79 00 - Demonstration and Training for Building Commissioning.

1.24 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of Departmental Representative. Lock all systems.

1.25 PAYMENTS FOR CX

- .1 The commissioning plan is included and distributed in all relevant sections of the tender form.

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 Section Includes:
 - .1 Commissioning forms to be completed for equipment, system and integrated system.

1.2 INSTALLATION/START-UP CHECK LISTS

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

- .1 PV forms to be used for checks, running tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

- .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

1.5 SAMPLES OF COMMISSIONING FORMS

- .1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
- .2 Revise items on Commissioning forms to suit project requirements.
- .3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

1.6 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

- .1 When additional forms are required, but are not available from Departmental Representative, develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
 - .1 Additional commissioning forms to be in same format as provided by Departmental Representative.

1.7 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 Departmental Representative provides Contractor project-specific Commissioning forms.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between theoretical and operation and reasons for variances.
 - .5 Verify operation in specified normal mode and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.
 - .9 Submit immediately after tests are performed.
 - .10 Reported results in true measured SI unit values.
 - .11 Provide Departmental Representative with originals of completed forms.
 - .12 Maintain copy on site during start-up, testing and commissioning period.

- .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual (BMM).

1.8 LANGUAGE

- .1 To suit the language profile of the awarded contract.

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 Section Includes:
 - .1 This Section is limited to portions of the Building Management Manual (BMM) provided to Departmental Representative by Contractor.
- .2 Related Requirements
 - .1 Section 26 05 00 - Common Work Results for Electrical.
- .3 Acronyms:
 - .1 BMM - Building Management Manual.
 - .2 Cx - Commissioning.
 - .3 HVAC - Heating, Ventilation and Air Conditioning.
 - .4 PI - Product Information.
 - .5 PV - Performance Verification.
 - .6 TAB - Testing, Adjusting and Balancing.
 - .7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

- .1 Standard letter size paper 216 mm x 279 mm.
- .2 Methodology used to facilitate updating.
- .3 Drawings, diagrams and schematics to be professionally developed.
- .4 Electronic copy of data to be in a format accepted and approved by Departmental Representative.

1.3 APPROVALS

- .1 Prior to commencement, co-ordinate requirements for preparation, submission, and approval with Departmental Representative.

1.4 GENERAL INFORMATION

- .1 Provide Departmental Representative the following for insertion into appropriate Part and Section of BMM:
 - .1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.
 - .2 Summary of structural and electrical systems installed and commissioned - as indicated in Section 1.4 of BMM.

- .1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
- .3 Description of building operation.
- .4 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM.
- .5 Information on operation and maintenance of electrical systems and equipment installed and commissioned - Section 2.0 of BMM.
- .6 Operating and maintenance manual - Section 3.2 of BMM.
- .7 Final commissioning plan as actually implemented.
- .8 Completed commissioning checklists.
- .9 Commissioning test procedures employed.
- .10 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative.
- .11 Commissioning reports.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

- .1 For detailed requirements refer to Section 01 78 00- Closeout Submittals.
- .2 Departmental Representative to review and approve format and organization within 12 weeks of award of Contract.
- .3 Include original manufactures brochures and written information on products and equipment installed on this project.
- .4 Record and organize for easy access and retrieval of information contained in BMM.
- .5 Include completed PI report forms, data, and information from other sources as required.
- .6 Inventory directory relating to information on installed systems, equipment and components.
- .7 Approved project shop-drawings, product and maintenance data.
- .8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown, and training material.
- .9 Inventory and location of spare parts, special tools, and maintenance materials.
- .10 Warranty information.
- .11 Inspection certificates with expiration dates, which require on-going re-certification inspections.
- .12 Maintenance program supporting information including:
 - .1 Recommended maintenance procedures and schedule.
 - .2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 LIFE SAFETY COMPLIANCE (LSC) MANUAL

- .1 Samples of LSC Manual will be available from Departmental Representative.
- .2 Content of Manual:
 - .1 All possible Emergency situations modes including: presence of fire and smoke, power failure.
 - .2 Emergency control procedures for power.
 - .3 Emergency contacts and numbers.
 - .4 Manual to be readily available and comprehensible to non-technical readers.

1.7 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

- .1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:
 - .1 General:
 - .1 Finalized commissioning plan.
 - .2 WHMIS information manual.
 - .3 Approved "as-built" drawings and specifications.
 - .4 Procedures used during commissioning.
 - .5 Cross-Reference to specification sections.
 - .2 Structural:
 - .1 Inspection certificates, construction permits.
 - .2 Anchor log books.
 - .3 PV reports.
 - .3 Electrical:
 - .1 Installation permits, inspection certificates.
 - .2 TAB and PV reports.
 - .3 Electrical work log book.
 - .4 Charts and schedules.
 - .5 Locations of cables and components.
 - .6 Copies of posted instructions.
- .2 Assist Departmental Representative with preparation of BMM.

1.8 LANGUAGE

- .1 English and French Language to be in separate binders.

1.9 IDENTIFICATION OF FACILITY

- .1 When submitting information to Departmental Representative for incorporation into BMM, use following system for identification of documentation.

1.10 USE OF CURRENT TECHNOLOGY

- .1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.
- .2 Obtain Departmental Representative's approval before starting Work.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

DIVISION 02

Part 1 General

1.1 SUMMARY

- .1 The purpose of this section is to list all of the activities involved in demolition and dismantling of the site, protection of elements and disposal of waste.

1.2 RELATED SECTIONS:

- .1 Not used.

1.3 REFERENCE STANDARDS

- .1 Sustainable Development Plan 2010-2015.
 - .1 PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS)
- .3 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .4 Bureau de normalisation du Québec (BNQ)
 - .1 *Entretien arboricole et horticole, partie V- Abattage des trees, essouchement et élimination des pousses* (NQ 0605-200). [Part 5 of Quebec standard for arboricultural and horticultural maintenance, available in French only, covers felling trees and removing stumps and shoots]

1.4 DEFINITIONS

- .1 Selective Demolition: Sequencing demolition activities to allow separation and sorting of selected site 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 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 19- Construction Construction Waste Management and Disposal and as follows:
 - .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.

- .4 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.
- .5 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Construction Waste Management and Disposal.
- .6 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Construction Waste Management and Disposal.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-demolition meetings
 - .1 Convene meeting with Departmental Representative 1 week prior to beginning work to:
 - .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work.
 - .3 Coordinate with other building subtrades.
 - .4 Examine existing site conditions adjacent to demolition work, prior to start of Work.
 - .5 Waste reporting requirements.
 - .2 Hold meetings as recommended by the Departmental Representative.
 - .3 Ensure key personnel attend.
 - .4 WMC must provide verbal report on status of waste diversion activity at each meeting.
- .2 Scheduling:
 - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .2 In event of unforeseen delay notify the Departmental Representative in writing. .

1.6 SUBMITTALS

- .1 Not used.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial/Territorial regulations.

1.8 SITE CONDITIONS

- .1 Environmental protection:

- .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Fires and burning of waste or materials is not permitted on site.
- .4 Do not bury rubbish waste materials.
- .5 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.
- .6 Ensure proper disposal procedures are maintained throughout the project.
- .2 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities as directed by the Departmental Representative.
- .4 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .5 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

1.9 EXISTING CONDITIONS

- .1 Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work:
 - .1 Hazardous materials will be as defined in the *Hazardous Materials Act*..
- .2 Site elements that will be demolished are based on their condition on date that tender is accepted.

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 EXAMINATION

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of sandblasting required.

- .2 The Departmental Representative does not guaranty that existing conditions are the same as those indicated in Project Record Documents.
- .3 Inventory and record the condition of items being removed and salvaged.
- .4 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to the Departmental Representative.
- .5 Verify that hazardous materials have been remediated before proceeding with site demolition operations.

3.2 PREPARATION

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

3.3 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.

3.4 REMOVAL

- .1 Remove items as indicated and transport them off the site.
- .2 Do not disturb items designated to remain in place.
- .3 At the junctions of the work boundaries, make sure to remove edge restraints, concrete pavers and troughs in such a way as not to affect the adjacent construction systems.
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by the 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 or future pavement area.
- .5 Salvage:
 - .1 Dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated.
- .6 Disposal of Material:

- .1 Dispose of materials not designated for salvage or reuse on site, as instructed by the Departmental Representative, at authorized approved facilities.
- .2 Trim disposal areas to approval of the Departmental Representative.

3.5 TRANSPLANTING OF TREES

- .1 Identification of trees:
 - .1 The contractor shall identify, on site, with the Departmental Representative, every tree that must be transplanted.
 - .2 The contractor shall inform the Departmental Representative of any visible or foreseeable constraints that might interfere with the transplanting work.
- .2 Obstacles to transplanting:
 - .1 The contractor may, under the supervision of the Departmental Representative and when deemed necessary, prepare the ground to facilitate the approach of the transplanting equipment.
- .3 Transplanting location:
 - .1 The contractor shall determine, on site, with the Departmental Representative, the location to which the trees will be transplanted within a 20 km radius.
- .4 Pruning of branches:
 - .1 When branches in the area where equipment will be operating may be damaged by the work, the Departmental Representative shall indicate on site the interfering branches to be removed.
 - .2 This protective pruning must be performed before the equipment is operated and must be performed in accordance with the thinning method prescribed in standard BNQ 0605-200.
- .5 Transplanting:
 - .1 The contractor shall submit to the Departmental Representative, for approval, an intervention method to ensure the success of the transplanting work, making sure to provide the appropriate size of transplanter to maximize the chances of success.
 - .2 In the case of immediate transplanting, the contractor shall:
 - .1 Excavate the hole using a truck-mounted transplanter with three hydraulic shovels to extract the tree;
 - .2 Extract the plants carefully, with a transplanter or extractor, so that the root balls remain intact.
 - .3 Transplant the tree directly to the planned location.
 - .3 If stone, wood, concrete or other underground obstructions make it impossible to transplant the tree, the Departmental Representative shall approve the decision not to transplant it and the machinery shall be moved to another tree to be transplanted.
 - .4 Cutting of roots:
 - .1 The contractor shall have specialized personnel, following the instructions of the Departmental Representative, make clean or surgical

cuts of any tree roots exposed and damaged by the excavation work or by the removal of existing structures.

STOCKPILING

- .6 Label stockpiles, indicating material type and quantity.
- .7 Designate appropriate security resources / measures to prevent vandalism, damage and theft.
- .8 Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.
- .9 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.

3.6 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 receiving organizations compliant with applicable regulations.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
 - .1 Use approved landfills that comply with the applicable regulations.
 - .2 Written authorization from Departmental Representative is required to deviate from specified disposal facilities.

3.7 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.
- .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.

3.8 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.

3.9 PROTECTION

- .1 Repair the damage caused to adjacent materials, equipment and property by the selective demolition of structures on the site.

END OF SECTION

DIVISION 03

PART 1 General

1.1 DESCRIPTION

- .1 Work covered by this section includes the provision of all materials, equipment supplies and services, labour and transportation to fully carry out the following:
 - .1 Design, construct, provide, assemble, dismantle and maintain all formwork, scaffolding and falsework required for the construction of all structures specified or shown on the drawings.
 - .2 Install sleeves, anchor bolts, anchoring components, anchor plates, embedded components, grooves, sockets, angle irons, accessory parts, drains and all parts embedded in concrete shown on the plans of all disciplines or described in the invitation to tender document.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specification sections.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86-09, Engineering Design in Wood.
 - .3 CSA O121-08, Douglas Fir Plywood.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CSA O153-M1980, Poplar Plywood.
 - .6 CAN/CSA-O325-07, Construction Sheathing.
 - .7 CAN/CSA 437.0-93, Standards on OSB and Waferboard.
 - .8 CSA S269.1-1975, Falsework for Construction Purposes.

- .9 CAN/CSA-S269.2-M87, Access Scaffolding for Construction Purposes
- .10 CAN/CSA-S269.3-M92, Concrete Formwork.
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI, Exterior Plywood for Concrete Formwork.
- .3 Publications du Québec:
 - .1 S-2.1 ; Loi sur la santé et la sécurité du travail.
 - .2 S-2.1, r.4; Code de sécurité pour les travaux de construction.
- .4 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC-S701-05, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.4 CONTRACTOR'S RESPONSIBILITIES

- .1 Assume responsibility of concrete formwork and falsework. The Departmental Representative's review of the formwork and falsework shall not release the specialized Contractor from his responsibility regarding the provision of structures that fully comply with the drawings and specifications.
- .2 The Contractor shall be aware of all laws and regulations that apply to the design and construction of formwork and falsework and shall comply with these requirements. Comply with regulations including the Quebec Safety Code, S-2.1, r.4, regarding shoring of concrete formwork.
- .3 Before using the formwork and falsework, give the Departmental Representative a signed statement written by an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec, and which bears the Engineer's seal. The statement should certify that the formwork and falsework comply with the signed and sealed drawings, and that they may be used for their intended purposes.

1.5 ARCHITECTURAL CONCRETE

- .1 The specialized Contractor shall take into account the fact that a significant part of the formwork is for concrete that will remain visible and must be considered architectural concrete.

- .2 The concrete used to build the following components shall be considered architectural concrete.

COMPONENTS	DESCRIPTION
<ul style="list-style-type: none">▪ Staircase▪ Shear walls▪ Beams / columns	All surfaces of these components above the main floor level.

1.6 SHOP DRAWINGS

- .1 Produce shop drawings of formwork and falsework, which describe all the necessary components required to perform the work in compliance with the drawings and specifications.
- .2 Have an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec sign these shop drawings and affix his seal.
- .3 Before performing concrete formwork or falsework, submit these drawings to the Departmental Representative for review and comments. All documents shall be submitted in triplicate. A single (1) annotated copy shall be returned to the Contractor. The Contractor shall be responsible for making additional copies and distributing them.
- .4 The shop drawings shall indicate, show or include the construction method and work schedule, procedures relating to shoring, the removal of forms, and the reinstallation of supports, the materials, the specific architectural characteristics of visible surface finishes, the location of joints, fasteners, ties and interior coatings, and the location of embedded falsework components. Comply with CSA S269.1 falsework drawing requirements. Comply with CAN/CSA-S269.3 formwork drawing requirements.
- .5 Shop drawings shall indicate, show or include formwork data such as the allowable speed and temperature at which concrete may be placed into the forms.
- .6 In addition to the details requested in 1.6.4., indicate on the shop drawings, at each location where the falsework is connected or leaning on an existing structure or a structure under construction, or already completed, the intensity and direction of maximum loads exerted on the load-bearing structure, taking into account construction site loads.
- .7 Specify the order in which the concrete formwork and falsework are to be assembled and dismantled, according to the Departmental Representative's directives.

1.7 FORMWORK AND FALSEWORK DESIGN

- .1 Design the falsework according to trade practices making sure not to exert abnormal stress on the structure under construction.

- .2 Take construction sequences into account when designing the falsework. Describe on the shop drawings or in an explanatory note how and in what order to use the formworks, the position of specified construction joints and the falsework and formwork reuse principle. Submit the explanatory note and the relevant shop drawings to the Departmental Representative for review.
- .3 For vertical components, vertical construction joints shall be a maximum of 18 m apart. Submit the location of construction joints to the Departmental Representative.
- .4 The specialized Contractor is entirely responsible for engineering, locating and building the formworks.
- .5 The formworks are engineered to sustain the loads and lateral pressures described in Section 102 of the American publication "Recommended Practice for Concrete Formwork" (ACI 347). Wind loads are those recommended by the latest edition of the National Building Code.
- .6 Engineering considerations and the allowable loads shall comply with Section 103 of the above mentioned U.S. publication.
- .7 Every aspect of construction shall at all times comply with various government standards (municipal, provincial and federal standards) that govern the specialized Contractor's duties regarding worker safety on construction worksites.

Part 2 Products

2.1 MATERIALS

- .1 Submit all formwork material in direct contact with fresh concrete to the Departmental Representative for review.
- .2 Construction Lumber:
 - .1 in contact with concrete: form plywood.
 - .2 other: structural timber not warped and sawed straight
- .3 Formwork Materials
 - .1 To pour concrete with no particular architectural characteristics, use forms made of wood and wood products that comply with the CSA O121, CAN/CSA-O86, CSA 0437, CSA O151 standard[s].
 - .2 To pour concrete with specific architectural characteristics, use form materials that comply with the CAN/CSA-A23.1/A23.2 standard.
 - .3 Rigid insulating boards: that comply with CAN/ULC-S701 standard.

- .4 In the case of exposed formwork surfaces (architectural concrete), use new formwork materials. The forms shall be made of 20 mm thick 1200 x 2400 plywood, sanded and covered with a coat of high quality form release oil.

For lining only, use 7 mm thick three-ply plywood. Exposed formwork surfaces are those indicated in Section 1.5 of these specifications and those shown on the Architect's plans.
- .5 Interior formwork liners
 - .1 Plywood: Douglas fir in compliance with the CSA O121.
 - .2 Waferboard: that complies with the CSA O437.0-93 standard.
- .6 Form release agent: non-toxic, biodegradable, and with low VOC content.
- .7 Form release oil: Colourless, non-toxic, biodegradable, low VOC content, mineral oil free from kerosene, whose viscosity is 15 to 24 mm²/s at 40°C and whose flashpoint in an open crucible is at least 150°C.
- .8 Falsework Materials: in compliance with the CSA S269-1, Table 1 standard. Identify the materials using a quality index or provide certificates, trial data or other attestations of compliance.
- .9 Form ties can be:
 - .1 metal ties embedded in concrete, designed to be broken at least 25 mm under the surface of the hardened concrete after the forms have been removed;
 - .2 fixed or variable length metal ties whose ends are moveable bolts. The part of the tie embedded in the concrete is embedded at least 25 mm under the surface of the hardened concrete;
 - .3 Spacety and Acrow-Richmond brand ties equipped with moulded water barriers at each end, for all the work. Both ends of these formwork ties shall be equipped with plastic cones at least 25 mm in diameter, which provide a minimum 25 mm of coverage on the broken end of the tie embedded in the concrete.
- .10 In the case of an exposed formed surface (architectural concrete), ties shall be equipped with plastic cones a maximum 38 mm in diameter, which provide a minimum 25 mm of coverage.
- .11 In the case of concrete that requires architectural features, use ties equipped with plastic cones and pale grey concrete plugs.

- .12 Sleeves, fasteners, anchors and other parts embedded in concrete meet the requirements of the drawings and specifications, and comply with Sections 6.2 and 6.7 of the CAN/CSA-A23.2 standard. Sleeves embedded in concrete shall be equipped with a steel water barrier able to withstand a minimum of [60 kPa] of hydrostatic pressure or the pressure in the line if it is greater.

Part 3 Performance

3.1 CONSTRUCTION AND ASSEMBLY

- .1 Unless otherwise specified, build and use the formwork in compliance with the CAN/CSA-A23.1/A23.2 standard.
- .2 Before using the forms, clean and treat the form surfaces with form release oil in compliance with Section 6.5.3.3 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Before starting formwork and falsework construction, check the alignments, levels and centrelines, and make sure the dimensions match those indicated on the drawings.
- .4 Build and assemble the formwork in compliance with the CAN/CSA-S269.3 standard to obtain finished concrete structures whose shape, dimensions and levels comply with the indications and are situated in the locations indicated on the drawings and specifications.

Properly truss the forms and join them so as to keep the desired position and shape while the concrete is being poured and keep them trussed until the concrete has set.
- .5 Location tolerances and tolerances regarding the geometric configuration of components embedded in concrete after removal of the forms according to indications in the drawings shall comply with Section 6.4 of the CAN/CSA-A23.1/A23.2 standard.
- .6 Manufacture and build the falsework and assemble it in compliance with the CSA S269.1 standard and the COFI “Exterior Plywood for Concrete Formwork” guide.
- .7 Obtain the Departmental Representative’s written approval before pouring concrete directly on the ground or making openings in a form component, which are not indicated on the drawings, but which may be required for construction purposes.
- .8 Align the formwork joints and seal them to prevent any loss of cement. The formwork shall contain as few joints as possible. Adequate reinforcements shall be installed behind the joints between the plywood panels to ensure that the plywood panels form a smooth, continuous surface capable of withstanding all phases of the pour without losing their shape or shifting.
- .9 Before pouring concrete directly on the ground, level the walls and the bottom of the excavated area, then remove the loose soil.
- .10 Refer to the architectural drawings regarding concrete components with visible architectural finishes.

- .11 The footings and supports installed on the ground shall not be assembled on a frozen surface.
- .12 Design lot drainage to prevent the ground from being washed away from under the footings and the supports installed at ground level.
- .13 Arrange all formwork joints and ties symmetrically on all concrete surfaces that will be visible (architectural concrete) after the forms are removed. Submit for inspection by the Departmental Representative.
- .14 Build the grooves, dovetail joints, mouldings, mortises and tenons, openings, drips, recesses, expansion and construction joints according to the indications of the drawings and specifications. See Section 03 25 00 for isolation or expansion joint requirements.
- .15 Place the formwork, trusses and supports so workers are able to remove them without causing any shocks or damage to the concrete.
- .16 Forms may be reused except in the case of exposed formed surfaces. They may be reused after sufficient cleaning, providing their surfaces are not cracked or rough; cracked or rough forms must be trimmed and patched to the Departmental Representative's satisfaction.
- .17 Install openings in the forms or other devices to enable workers to inspect and clean the forms, and to enable concrete placement and consolidation.
- .18 Unless otherwise indicated, provide and install in the forms the sleeves, fasteners, anchors and other embedded components required in the drawings and/or specifications of all disciplines, in compliance with Section 6.7 of the CAN/CSA-A23.1/A23.2 standard. Immediately before pouring the concrete, use surveyor's equipment to check the dimensions required in the drawings and specifications and make sure that these parts meet specified tolerances.
- .19 Before closing the forms, notify the Departmental Representative beforehand to allow him to perform the required inspections. The pouring of the concrete into the forms shall not take place before the Departmental Representative's written authorization has been received.
- .20 Use 10 mm bevelled moulding for exterior corners, unless otherwise indicated.
- .21 Build forms for the architectural concrete components and install the ties according to the indications or directives provided. At times, the location of the joints may preclude the use of standard-sized panels or reduce the maximum allowable space between ties.

3.2 ANCHORS, SLEEVES AND EMBEDDED PARTS

- .1 Provide and install in the forms, the sleeves, fasteners, anchor plates and other embedded components required in the drawings and/or specifications, in compliance with Section 6.7 of the CAN/CSA-A23.1/A23.2 standard. The work shall comply with Section 03 25 00.

- .2 Provide and install in the forms, the anchor bolts for fasteners and machinery as shown and detailed in the drawings, in compliance with Section 6.7 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Install in the forms, the sleeves, conduits and ducts provided by others at the levels and locations shown on the mechanical, electrical, procedural and architectural drawings.
- .4 In all cases, comply with the installation tolerances specified in Article 6.7.3 of the CAN/CSA A23.1/A23.2 standard.
- .5 In slabs, place conduits between the upper and lower rows of reinforcement.
- .6 Install sleeves, conduits and ducts in compliance with the following requirements:
 - .1 The exterior diameter of the sleeves, conduits or ducts shall not exceed one third of the thickness of the beams, slabs or walls in which they are embedded;
 - .2 The centreline between adjacent components must be greater than or equal to three diameters;
 - .3 These parts shall not be positioned in a manner that reduces the strength of the structure;
 - .4 These parts shall not be embedded in ground slabs exposed to the weather;
- .7 If the requirements of Article 3.2.6 cannot be met, notify the Departmental Representative and await his instructions on how to proceed.
- .8 Make sure aluminium sleeves, conduits or ducts embedded in concrete are covered or adequately coated to protect them against aluminum corrosion.
- .9 Submit a sleeve location plan for approval by the Structural Departmental Representative.
- .10 Coordinate with subcontractors responsible for their supply the delivery (to the construction site) and the installation in the formwork of accessory parts.
- .11 It is forbidden to place in the formwork any accessory parts which are not indicated in the drawings, or required in the specifications or the drawings referred to in Sub-article .2 above, unless the Departmental Representative so authorizes .

3.3 REMOVAL OF THE FORMS AND REINSTALLATION OF THE SUPPORTS

- .1 Remove the formwork and dismantle the falsework in compliance with Article 6.5.3.5 of the CAN/CSA-A23.1/A23.2 standard, unless otherwise indicated.
- .2 Do not disturb or remove the formwork or falsework as long as the concrete has not become strong enough to support its own weight and the load it supports.
- .3 Have the Departmental Representative authorize the removal of the formwork and falsework.

- .4 Leave the formwork in place after the concrete has been poured for the following lengths of time:
 - .1 Walls : 3 days;
 - .2 Columns: 7 days;
 - .3 The periods of time specified above represent a cumulative number of hours, days or fractions of days, not necessarily consecutive, during which the ambient temperature is maintained above 10°C.
- .5 Reinstall all the supports required when frame components might be subject to additional loads during construction of the structure.
- .6 Notwithstanding the provisions of Sub-article .4 above, do not remove the forms unless the Departmental Representative authorizes their removal because he is satisfied with the measures taken to ensure the concrete cures properly and the concrete is protected against cold or heat and the weather.
- .7 However, the Departmental Representative may cancel the provisions of Sub-article .4 above if the non-destructive trials on the concrete placed in beam and slab forms indicate that the concrete has achieved 80% of the compression strength specified in Section 03 30 00 of these specifications. The non-destructive trials mentioned above shall have a recognized value and be approved by the Departmental Representative; he will determine beforehand the locations where they are to be performed. The costs of all these trials shall be borne by the specialized Contractor.
- .8 Even when the Departmental Representative has authorized him to remove the forms, the specialized Contractor remains solely responsible for all damage caused to concrete components if action is taken prematurely.
- .9 Depending on weather conditions, the placement of the concrete and curing conditions, the Departmental Representative may specify a minimum period of time that must elapse before the forms are removed from the various pours.
- .10 Reuse the formwork and falsework, notwithstanding the requirements of the CAN/CSA-A23.1/A23.2 standard.
- .11 The maximum spacing between the supports reinstalled at each of the main load inflection points is 2400 mm.

3.4 FILLING OF FORM TIE HOLES

- .1 Fill all cone-shaped cavities left after removal of the plastic cones at the ends of the form ties. Moisten beforehand as required by the manufacturer. Carefully smooth the surface after applying the mortar so that it blends in with the adjacent concrete surfaces. Allow to cure.

- .2 In the case of exposed surfaces (architectural concrete), check with the Architect whether the cone-shaped cavities need to be filled. Have the Architect approve the filling products used. The products used shall be of the same texture and colour as the concrete utilized.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Provide all the expertise, labour, materials, products, equipment and services needed to supply, detail, manufacture and install all the reinforcement steel shear heads, dowels, metallic wires that must be incorporated in the concrete components indicated in the structural drawings.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specification sections.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 American Society for Testing and Materials (ASTM):
 - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A143/A143M-07(2014), 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-17, Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction / Methods for Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-04, Design of Concrete Structures for Buildings.
 - .3 CSA G30.18-M92 (C2007), Cold-Drawn Steel Wire for Concrete Reinforcement.

- .4 CSA G40.21-04 (C2009), Welded Steel Wire Fabric for Concrete Reinforcement.
- .5 CSA G164-M92 (C2003), Deformed Steel Wire for Concrete Reinforcement.
- .6 CSA W186-M1990 (C2012), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- .4 Institut d'acier d'armature du Québec
 - .1 Manuel des normes recommandées, most recent edition.
- .5 Quebec Construction Code - Chapter I, Building and National Building Code of Canada:
 - .1 Code de construction du Québec – Chapitre I, Bâtiment, et Code National du Bâtiment – Canada 2015 (modifié) ainsi que le Guide de l'utilisateur – CNB 2015 : Commentaires sur le calcul des structures (Partie 4 de la division B).

1.4 SAMPLING, TRIALS AND INSPECTION

- .1 Provide the Departmental Representative with free access to the plant and the construction site at all times to enable him to verify, examine and supervise the quality of materials and their manufacture, and if required, take samples for testing, trial and analytical purposes.
- .2 Pouring of the concrete is not authorized before the Departmental Representative has inspected and approved the reinforcement in place.
- .3 At his request, send the Departmental Representative one (1) copy of the certificates issued by the steel mill attesting to the chemical composition and physical properties of the steel used to manufacture the reinforcement.
- .4 Upon request, inform the Departmental Representative regarding the proposed source of supply for the materials to be provided.

1.5 SHOP DRAWINGS

- .1 Submit for review and comments by the Departmental Representative, all shop drawings for all steel reinforcement for the work in compliance with the following requirements.
- .2 The format of the reinforcement drawings shall be the same as that of the drawings upon which they are based. The full project title and the name of the Departmental Representative, Professionals and the specialized Contractors shall appear on each drawing.
- .3 Submitted drawings will be in the form of one (1) electronic copy of each reinforcement drawing. One (1) copy of each order slip will accompany the drawings. One (1) electronic copy of the commented shop drawings will be returned to the Contractor.

- .4 Drawings must bear the seal and signature of a qualified Engineer licensed or licensed to practice in the Province of Quebec, Canada.
- .5 The reinforcement drawing shall clearly indicate:
 - .1 The number, nominal diameter, length, position, spacing and bending details of each type of bar shown on the drawings.
 - .2 The bar-supports, separators, additional bars and other accessories required to support and fasten the reinforcements while the concrete is being poured.
- .6 When not specified in the plans:
 - .1 Reinforcement overlap and sealing lengths shall comply with the requirements of Articles 7 and 12 of the CAN/CSA-A23.3 standard. Unless otherwise indicated on the drawings, all overlaps shall be Class B (1.3 Lc), in compliance with Table 17b: pre-stressed overlapping requirements for upper reinforcement in the Reinforcing Steel Institute of Canada's manual of standard practice.
 - .2 Overall dimensions of hangers, ties and coils shall comply with the minimum concrete cover thicknesses stipulated in Article 6.6.2 of the CSA-A23.1/A23.2 standard.
- .7 Unless otherwise indicated in the drawings, the hooks required at the end of certain bars, including hangers, ties and spirals are all "standard hooks", which shall comply with the description provided in Article 6.6.2 of the CSA A23.1/A23.2 standard.
- .8 The reinforcement shall be marked so that it is quick and easy to find on the purchase orders.
- .9 The Contractor shall provide shop drawings so the Departmental Representative has at least ten (10) working days to examine and comment on the shop drawings, which are submitted at each phase of the concrete work.
- .10 The reviewed shop drawings, which may or may not be annotated by the Departmental Representative, shall be returned to the specialized Contractor, who shall revise these drawings and resubmit them to the Departmental Representative for review and comment, if required. However, if the Departmental Representative finds that too many revisions are required, he shall return the drawings without annotating them; in addition, if the drawings need to be submitted more than twice, the Departmental Representative shall withhold funds from the specialized Contractor to pay for the cost of the Departmental Representative's additional reviews.
- .11 The specialized Contractor is solely responsible for the accuracy of his drawings; he cannot claim any supplement for delays caused by the discovery, on site, of errors or omissions on his own drawings, even if they have been reviewed by the Departmental Representative.
- .12 Unless otherwise indicated, use steel reinforcement details that comply with the most recent edition of the "Manuel des normes recommandées" published by the Institut d'acier d'armature du Québec.

- .13 Wait for final approval of the shop drawings before cutting and bending the rebar.
- .14 Submit the steel schedules that match the various shop drawings at the same time as the shop drawings.

Part 2 Products

2.1 MATERIALS

Description	Standards
▪ High adherence billet-steel reinforcement bars, regular category (R).	CAN/CSA G30.18 Grade 400
▪ Weldable high adherence steel reinforcement bars made of low alloy weldable steel, weldable category (W).	CAN/CSA G30.18 Grade 400
▪ Tie wire, annealed cold-drawn steel wire	ASTM A82/A82M
▪ High adherence steel wire for concrete reinforcement, 16 gauge	ASTM A82/A82M
▪ Welded steel wire fabric provided in flat sheets only	ASTM A185/A185M
▪ High adherence welded steel wire fabric in flat sheets only	ASTM A82/A82M
▪ Non-prestressed galvanized reinforcement	CAN/CSA G164
▪ Chairs, bar chairs, bar supports, spacers (rustproof)	CSA A23.1/A23.2
▪ Metal coupling	Reinforcement steel, "recommended standards manual" subject to the Departmental Representative's approval
▪ Steel fibres	ASTM A820/A820M-16 NOVOCON 1050 (FE) type of SI Concrete Systems

2.2 SUBSTITUTES

- .1 Obtain the Departmental Representative's written approval to substitute specified bars with bars of different dimensions, and to change spacing, overlapping or bending specified on the drawings.

2.3 FORMING

- .1 Form the bars at the factory, in compliance with requirements of the CAN/CSA-A23.1/A23.2 standard.
- .2 Unless otherwise indicated, forming tolerances are those indicated in Chapter 6 of the “Manuel des normes recommandées” published by the Institut d’acier d’armature du Québec. Bars that do not comply with these tolerances shall be rejected.

2.4 IDENTIFICATION

- .1 Clearly identify bar and wire fabric lots to conform to the shop drawings and steel schedules before shipping them to the construction site.
- .2 Use factory-labelled reinforcement bars. The label identifies the size, quality and manufacturer of the bar. All unlabelled bars shall be rejected.

Part 3 Performance

3.1 ON-SITE BENDING

- .1 Unless otherwise expressly indicated or authorized by the Departmental Representative, do not bend steel reinforcement bars on the construction site.
- .2 It is forbidden to bend rebar partially embedded in hardened concrete on site unless the Departmental Representative has authorized this procedure.

3.2 MANUFACTURE OF REINFORCEMENT

- .1 The manufacture of the reinforcement shall not start until the Departmental Representative has reviewed the drawings of this reinforcement.
- .2 Cut and bend the bar in strict compliance with the details shown on the drawings and in accordance with the requirements of the CAN/CSA-A23.1/A23.2 standard.
- .3 No substitution of the bars shown on the reinforcement drawing shall be allowed without the Departmental Representative’s authorization.
- .4 Take every precaution to avoid deforming or dirtying the reinforcement during transportation, handling and storage.

3.3 REINFORCEMENT INSTALLATION

- .1 Assemble and install the rebar with care and tie them with black annealed drawn steel wire. Use a pattern and number of supports that comply with Section 6.6.8 of the CAN/CSA-A23.1/A23.2 standard.
- .2 Install the rebar and keep them in place during the pouring of the concrete in compliance with the tolerances stipulated in Section 6.6.8 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Unless otherwise indicated on the drawings or in Section 3.6 of these specifications, the minimum concrete cover thickness around reinforcement bars is that stipulated for each of the various structural components in Article 6.6.6 of the CAN/CSA A23.1/A23.2 standard.
- .4 If required, before placing the rebar in the formwork, remove all excess rust, scale, mud, oil and any other dirt likely to reduce the concrete's adherence.
- .5 Use an adequate number of support bars of the height and rigidity required to ensure all concrete coverage of the rebar complies with the thicknesses stipulated on the drawings and in the standards.
- .6 Have the Departmental Representative approve the rebar and its installation, before pouring the concrete. The Departmental Representative shall have 48 hours to approve the steel reinforcement before the concrete is poured.

3.4 OVERLAPS

- .1 Overlap the reinforcement as indicated on the drawings and typical details.
- .2 Overlapping lengths and extension lengths of bars beyond critical points shall comply with the CSA-A23.3 standard. Unless otherwise indicated on the drawings, all overlaps shall be Class B (1.3 Lc), in compliance with Table 17b: tension overlapping requirements for upper reinforcement in the Reinforcing Steel Institute of Canada's manual of standard practice.
- .3 Obtain the Main Contractor's approval for the locations of reinforcement overlaps other than those shown on the drawings.
- .4 Overlap at least 10% of the surface of the wire fabric sheets, but never less than one mesh width.

3.5 WELDING

- .1 Do not weld steel rebar unless authorized in writing by the Departmental Representative.
- .2 Where permitted by the Departmental Representative, perform the rebar welding work in compliance with Section 6.6.10. of the CAN/CSA-A23.1/A23.2 standard and the requirements of the CSA W186 standard. When welding is performed, the use of category W weldable bars is mandatory.

- .3 All welding work shall be assigned to a company accredited by the Canadian Welding Bureau and shall be performed in compliance with the requirements of the most recent version of the CSA W186 standard. Prior to starting any welding work, submit to the Departmental Representative for verification, all details regarding the welds to be performed. In this case, the steel reinforcement to be welded shall comply with the requirements of the most recent version of the CSA G30.16 standard. Pre-heat all steel reinforcement as required by these standards.

3.6 REINFORCEMENT COVERAGE

- .1 Unless otherwise indicated on the drawings, the reinforcement bars shall be installed at the following specific distances from the surface of the concrete:

	Coverage
A) Concrete poured directly on the ground	75 mm
B) Concrete exposed to the ground or the weather	
a) Bars larger than 15 M in walls and slabs or main bars in beams and columns	50 mm
b) Bars 15 M or smaller	40 mm
c) Ties, hangers and spiral reinforcement	40 mm
C) Concrete not exposed to the weather Class N	
a) Slabs (other):	25 mm
- top steel rebar	25 mm
- bottom steel rebar	50 mm
b) Curbs and coping	40 mm
c) Beams (main steel rebar)	50 mm
d) Columns (main steel rebar)	25 mm
e) Walls	30 mm
f) Ties, hangers and spiral reinforcement	
D) Concrete exposed to chlorine (exposure classes C-1, C-XL, C-3 and C-4)	The reinforcement coverage shall not be less than any of the following values; - 60 mm - twice the nominal diameter of the reinforcement - twice the maximum nominal diameter of aggregate

- .2 For conditions A-B-C of the preceding table, the ratio between coverage and the maximum size of the aggregate as well as the ratio between the coverage and the nominal diameter of the bars shall be at least 1.5 for concrete exposed to the ground and weather, and 1.0 for concrete not exposed to the ground and weather.

3.7 STORAGE AND DELIVERY

- .1 Deliver the reinforcement and wire fabric to the construction site in clearly identified lots.
- .2 Handle the reinforcement and wire fabric with care to avoid deforming them.
- .3 As soon as they are delivered on site, properly stack the steel reinforcement and wire fabric on wood skids to protect them against rust and keep them off the ground.
- .4 Cover all stored steel with a woven tarp to protect it from the weather.
- .5 During transportation and handling, use a covering to protect the parts of the bars coated with epoxy and paint.

3.8 CLEANING

- .1 In order for the pouring of the concrete to take place, the condition of the reinforcement bars shall comply with Section 6.1.5 of the CAN/CSA A23.1/A23.2 standard.
- .2 If required, clean the reinforcement immediately before the concrete is poured.

3.9 REINFORCEMENT DOWELLING

- .1 The installation of reinforcement dowels in concrete that has already been poured shall be performed using a Hilti HIT, HY-150 epoxy-based system.
- .2 The sealing length of the dowels is that indicated in the sealing lengths table provided on the drawings.
- .3 Certain types of dowels shall have conical threads designed to work with anchors equipped with conical threads.

3.10 ON-SITE TOUCH-UPS

- .1 Using a compatible finishing product, touch up damaged or cut ends of galvanized or epoxy-coated reinforcement to provide a continuous coat.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 This section specifies the requirements regarding the providing, placement, finishing, protection and curing of the cast-in-place concrete.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specification sections.

1.3 REFERENCES

- .1 The following standards and publications are mentioned in this section of the specifications. They form an integral part of the specifications and their provisions apply, but are not limited by the other provisions of this section.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).
 - .2 ASTM C260-06, Air-Entraining Admixtures for Concrete.
 - .3 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .4 ASTM C332-09, Standard Specification for Lightweight Aggregates for Insulating Concrete.
 - .5 ASTM C494/C494M-08a, Chemical Admixtures for Concrete.
 - .6 ASTM C827/C827M-16, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
 - .7 ASTM C939/C939M-16a, Standard Test Method for Flow of Grout for Placed-Aggregate Concrete (Flow Cone Method).
 - .8 ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

- .9 ASTM D624-00 (2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- .10 ASTM D1751-04 (2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .11 ASTM D1752-04a (2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .3 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.
- .4 Canadian Standards Association (CSA)
 - .1 CAN/SA-A3000-08, Cementitious Materials Compendium (contain A3001, A3002, A3003, A3004 and A3005).
 - .2 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
 - .3 CSA-A23.3-04, Design of Concrete Structures.
 - .4 CSA A283-06 , Qualification Code for Concrete Testing Laboratories.
- .5 National Research Council Canada (NRC) and Régie du bâtiment du Québec:
 - .1 Code de construction du Québec, Chapitre I – Bâtiment, and National Building Code – Canada 2015 (modified) as well as the User Guide – NBC 2015 : Comments on calculation of structures (Part 4 of division B).

1.4 SAMPLES

- .1 At least four (4) weeks before beginning the work, advise the Departmental Representative regarding the proposed source of supply for the aggregates, and allow him to access the source for sampling purposes.

1.5 CERTIFICATES

- .1 At least (4) weeks prior to starting concrete work, provide the Departmental Representative with copies of the manufacturer's trial reports, as well as a certificate issued by a qualified independent testing and inspection laboratory attesting that the materials listed hereinafter will comply with the specified requirements.
 - .1 Portland Cement
 - .2 Blended Hydraulic Cement
 - .3 Supplementary Cementing Materials
 - .4 Grout
 - .5 Admixtures
 - .6 Aggregates
 - .7 Water
 - .8 Waterstops
 - .9 Waterstop Joints
 - .10 Joint Filler
- .2 Provide the mix formulas for approval by the Departmental Representative and a certificate attesting that the selected mix will produce concrete of the required quality, strength and performance, and that it complies with the requirements of the CSA-A23.1/A23.2 standard.
- .3 Provide a certificate attesting that the batching plant, equipment and materials that will be used to produce the concrete comply with the requirements of the CSA-A23.1/A23.2 standard.
- .4 The Departmental Representative's acceptance of the cement mix or mixes shall in no way release the specialized Contractor from his responsibility to provide concrete whose properties, in both its elastic and hardened states, meet the requirements of these specifications.
- .5 All documents will be submitted in one (1) electronic copy. One (1) annotated electronic copy will be returned to the Contractor.

1.6 QUALITY ASSURANCE

- .1 At least four (4) weeks prior to starting concrete work, submit proposed quality control methods for approval by the Departmental Representative, regarding the following items:

- .1 Hot weather concreting
- .2 Cold weather concreting
- .3 Curing
- .4 Finishes
- .5 Stripping
- .6 Joints

Part 2 Products

2.1 MATERIALS

- .1 Cement: Type GU and/or Gub Portland cement that complies with the CSA-A3001 standard.
- .2 Fine aggregate: of normal density, complying with Article 4.2.3 of the CSA-A23.1/A23.2 standard. The aggregate may be natural sand or manufactured sand containing at least 20% natural sand.
- .3 Coarse aggregate: of normal density, complying with CSA-A23.1/A23.2 standard. The particles shall be clean, durable and free from dust and harmful materials. The maximum aggregate size shall be 20 mm, unless otherwise indicated. Subject to the Departmental Representative's approval, a 13 mm maximum aggregate size may be used in certain areas where concrete flow is restricted. Coarse aggregates must be of normal density. The quantity of flat and elongated particles shall be in accordance with Table 12 of CSA-A23.1 / A23.2 standard.
- .4 Mixing water: complies with CSA-A23.1/A23.2 standard.
- .5 Air-entraining admixture: complies with the ASTM C260 standard.
- .6 Chemical and pozzolanic mineral admixtures: comply respectively with the requirements of the ASTM C494/C494M and ASTM C1017/C1017M standards. The use of calcium chloride or admixtures that contain calcium chloride is not allowed. The Departmental Representative must approve accelerators or retarders during hot and cold weather concrete work.
- .7 Non-shrink mortar for concrete repairs: pre-mixed Portland cement-based product containing a non-metal aggregate and a plasticizer, capable of achieving at least 35 MPa of compression strength at seven (7) days.
- .8 Superplasticizer: complies with requirements of the ASTM C494/C949M standard.
- .9 Supplementary Cementing Materials: comply with the CSA-A3001 standard.

- .10 Cementitious hydraulic slag: complies with the CAN/CSA-A362 standard.
- .11 Set retarders: comply with the ASTM C494/C494M water-based, low VOC content, solvent-free standard. The set retarder film shall never be exposed to humidity.

2.2 MIX DESIGN

- .1 Assume responsibility for the mix of each type of concrete required, while taking into account the requirements described in Section 2.1 of these specifications and the following criteria in compliance with possibility No. 1 presented in Table 5 of the CSA-A23.1/A23.2 standard.
 - a) Concrete for walls and exterior columns
 - tested compression strength: 35 MPa at 28 days
 - cement type: GUb or GUb-SF
 - exposure category (Table No. 1, CSA-A23.1/A23.2): C-1
 - maximum nominal size of coarse aggregate: 20 mm
 - air content: 5 to 8%
 - Chemical admixtures: comply with the ASTM C494/C494M standard.
 - normal density concrete
 - b) Concrete for raft slabs, walls, beams, columns, structural slabs, floating slabs and slabs on interior floors and footings:
 - minimum tested compression strength at 28 days: 35 Mpa
 - cement type : GU
 - exposure category (Table No. 11, CSA-A23.1/A23.2): C-1
 - Chemical admixtures: comply with the ASTM C494/C494M standard.
 - normal density concrete
- .2 Obtain the Departmental Representative's approval for all admixtures used in concrete mixes (superplasticizers and required air-entrainers or other admixtures needed for any specific purpose, designated by the specialized Contractor). The use of calcium chloride is prohibited.
- .3 Provide a sample of the admixture(s) used, at the Departmental Representative's request.

- .4 Follow the manufacturer's instructions when using admixtures.
- .5 The specialized Contractor is responsible for ensuring the admixtures are compatible with one another and with the materials included in the mix.
- .6 Enter the type and quantity of the admixture(s) used on the concrete shipping slip.
- .7 The use of an admixture shall never reduce the soundness of the concrete or its ability to withstand freezing and thawing.
- .8 For exterior concrete elements with a decorative apparent finish identified on the structural drawing and the landscape documents, aggregate color and appearance will have to comply with the specified finish and appearance in the landscape documents.

2.3 CONCRETE CONTROL

- .1 Concrete quality control performed in compliance with the CSA-A23.1/A23.2 standard by a designated laboratory at the Main Contractor's expense.
- .2 Submit to the laboratory for approval, proposed formulas for batching the mixes for each class of concrete; specify the type and brand of all admixtures used.
- .3 Provide the laboratory with samples of the fine and coarse aggregates that will be incorporated into the concrete blends and identify the quarry they come from.

Unless otherwise directed in writing by the Departmental Representative, also provide the laboratory with a document signed by a recognized petrographer certifying that none of the harmful alkali-aggregate and cement-aggregate reactions described in Appendix B of the CSA-A23.1/A23.2 standard are likely to occur in the concrete after it has been poured.
- .4 Notify the laboratory at least 24 hours before each concrete pour, whatever the volume involved.
- .5 Cooperate with sampling and facilitate testing. Provide free access to the structures. Provide the required concrete at no cost. If applicable, protect and provide a storage area for the samples taken.
- .6 The concrete's compression strength shall be checked during construction by taking 3 core samples per 75 m³ poured or at least 3 core samples per pour. The Departmental Representative may ask the laboratory to produce a fourth core sample and let it cure on the construction site as a control sample. A sample shall be crushed on the 7th day; the two other samples shall be crushed on the 28th day.
- .7 The cylinders shall be numbered consecutively and the laboratory report shall indicate the exact location of the concrete they represent in the framework, as well as the number of the truck that delivered the concrete.

- .8 The laboratory shall measure the concrete slump and air content every time it samples the concrete for strength tests and as often as necessary depending on the type of structure to be built.
- .9 Provide a sheltered location on site where the concrete core samples can be stored at an ambient temperature ranging from a minimum of 10°C to a maximum of 25°C before they are shipped to the trial laboratory.
- .10 If the core sample test results do not comply with Article 4.4.6.6 of the CSA A23.1/A23.2 standard, the Departmental Representative may require that Section 4.4.6.7 of the standard be applied.
- .11 The specialized Contractor is solely responsible for the all concrete work required to complete the structures as indicated on the drawings or stipulated in the Specifications. All work that does not meet the requirements of the Specifications, for any reason whatsoever (quality of materials, batching, placement, strength, impermeability, etc.), shall be modified in compliance with the Departmental Representative's requirements, or it shall be completely demolished and rebuilt in compliance with the provisions of the Specifications and drawings, at the specialized Contractor's expense.

Part 3 Performance

3.1 REPARATION

- .1 Ensure that the forms are erected and that they are clean and free of ice, snow and water, and that form reinforcement and hardware are installed in compliance with the requirements of Sections 03 10 00, 03 20 00 and 03 25 00 of the specifications.
- .2 Before starting the work, obtain the Departmental Representative's approval of the concrete placement methods, which shall comply with Section 7.2 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Obtain the Departmental Representative's written authorization before performing the concrete work and notify him 24 hours before beginning the work. To notify the Departmental Representative, the "Avis de bétonnage" form from Dessau must be used and duly completed by the Contractor.
- .4 Pumping concrete is [forbidden] [shall only be permitted once the equipment and the mix are approved].
- .5 Ensure that the reinforcement and embedded components are not moved while the concrete is being poured.
- .6 Before performing the concrete work, obtain the Departmental Representative's written authorization regarding the proposed method for protecting the concrete during the pour and the subsequent cure.

- .7 No concrete shall be poured without the Departmental Representative's written authorization.
- .8 Authorization to pour concrete shall only be provided once the Departmental Representative has completed his own inspection of the formwork and determined that the requirements of Article 3.1 appear to have been met.
- .9 It is forbidden to pour concrete when it is raining or snowing, unless the Departmental Representative provides the required authorization, being satisfied with the measures taken to shelter the concrete while it is being transported and placed.
- .10 The Departmental Representative's authorization to pour concrete when the outside temperature is below 5°C or above 25°C shall in no way release the specialized Contractor from his full responsibility regarding the strength and soundness of the concrete to be poured.
- .11 Keep a concrete placement log, which indicates the date and location of each placement, the concrete's characteristics, the truck numbers, the ambient temperature, samples taken and other relevant information.
- .12 Immediately before placing the concrete, carefully clean and remove all waste and debris of any kind from the space the concrete will occupy.
- .13 In areas where new concrete is bonded to an existing structure, drill holes in the existing concrete and install steel dowels made of high adherence steel rebar in it and thoroughly embed the dowels with non-shrink epoxy grout to anchor and maintain them in the positions indicated.
- .14 No load shall be exerted on the new concrete components until the Departmental Representative has provided the required authorization.

3.2 MANUFACTURE AND DELIVERY OF THE CONCRETE

- .1 Provide ready-to-use concrete manufactured in a concrete plant, transported and discharged at the site in compliance with Section 5.2 of the CAN/CSA-A23.1/A23.2 standard, or provide concrete manufactured on site, in compliance with all the requirements of that same section. If the second alternative is chosen, submit the entire procedure to the Departmental Representative for approval.
- .2 The manufacturer of the ready-to-use concrete is solely responsible for batching the concrete, and he shall personally, at his expense, take all necessary measures to ensure the quality and uniformity of his product.
- .3 Require that the concrete supplier provide a delivery slip for each load of concrete and provide the Departmental Representative with a copy of these slips. The slips shall contain the following information: name and address of the supplier's company, truck number, specialized Contractor's name, project name and location, class of concrete, cumulative quantity, start of discharge, end of discharge, maximum size of aggregate, slump and air-entrainment required, types of admixtures used, quantity and type of cement and quantity of water.

- .4 The addition of water to the mix after the initial batching shall only be carried out in strict adherence with Article 5.2.4.3.2 of the CAN/CSA-A23.1/A23.2 standard, but the maximum quantity used shall be 6 l/m³. Submit all anticipated additions to the Departmental Representative for approval and control. Indicate on the delivery slip the quantity of all water added at discharge.
- .5 Plan the manufacture of the concrete and schedule the deliveries to the site so that each pour can be performed without any interruptions. Each batch of concrete shall be completely discharged into the forms within two (2) hours of beginning of batching.
- .6 Never remix concrete or mortar that has started to set.
- .7 The temperature of the concrete at discharge shall be within the range presented in Table 1 of the CAN/CSA-A23.1/A23.2 standard and shall be controlled according to Article 5.2.4.4 of the same standard. Use all protective measures required for this purpose.
- .8 No aluminum component shall be used to batch, transport or place the concrete.

3.3 IMPLEMENTATION

- .1 Place the concrete in compliance with the requirements of the CAN/CSA-A23.1/A23.2 standard.
- .2 Carry out the consolidation of the concrete using models and sizes of mechanical vibrators approved by the Departmental Representative.
- .3 Select an appropriate type and number of vibrators and use them in accordance with Section 7.2.5 of the CAN/CSA-A23.1/A23.2 standard.
- .4 Bind the fresh concrete with rock or hardened concrete in accordance with Section 7.2.2 of the CSA-A23.1/A23.2 standard.
- .5 Saturate hardened concrete surfaces with water immediately before pouring concrete on these surfaces.
- .6 Lay the concrete without interruption or in layers thick enough that each new layer will bind with the underlying layers before they have hardened enough to form cold joints.
- .7 If difficulties arise during pouring, change the concrete formula following the laboratory's directives and use the admixture(s) prescribed by the laboratory, and assume all expenses for this procedure.
- .8 Adding a superplasticizer to the concrete before it has been poured into the forms is mandatory when pouring walls (including retaining walls) and columns.

3.4 CONCRETE CURING

- .1 The concrete shall be cured according to the requirements of section 7.4 of the CSA-A23.1/A23.2 standard. Walls and slabs 500 mm thick or thicker are considered mass concrete.
- .2 The use of curing compounds is prohibited.
- .3 The concrete of walls and other vertical elements shall be cured using two layers of jute kept moist at all times.
- .4 The concrete of slabs shall be cured using a using a cover kept moist at all times,
- .5 Slabs and other unformed surfaces shall be kept moist for a period of at least 7 days.
- .6 Walls, beams, columns and other formed surfaces shall undergo the following 7-day curing schedule:
 - .1 forms left in place: 3 days;
 - .2 moist curing after removal of the forms: 4 days.
- .7 When the outside temperature exceeds 20°C for mass concrete or otherwise 27°C, keep the forms moist before pouring the concrete and throughout the entire time they remain in place.
- .8 In cold weather, water curing ends 12 hours before the end of protection.
- .9 Throughout the entire cure, the concrete shall never be under any load and shall be adequately protected against violent shocks, excessive vibration, weather and other disturbances.
- .10 The provision, installation and maintenance of all falsework and devices required for the curing and protection of the concrete in hot or cold weather, as well powering the equipment, are part of the contract work, for which all costs are to be assumed.

3.5 CONCRETE PROTECTION

- .1 In hot weather, the concrete shall be protected according to Article 7.4.1.4 of the CSA-A23.1/A23.2 standard.
- .2 Concrete components containing silica fume shall be protected from drying according to Article 7.4.1.2 of the CSA-A23.1/A23.2 standard.
- .3 Other concrete components shall be protected from dryout based on Appendix D of the CSA-A23.1/A23.2 standard.
- .4 In cold weather, the concrete shall be protected according to Article 7.4.1.5 of the CSA-A23.1/A23.2 standard.

- .5 Methods for protecting concrete in cold weather are detailed in Chapter 7.4.1.5.3 of CSA-A23.1/A23.2 standard.

3.6 FINISHING OF FORMED SURFACES

- .1 Clean and finish the formed surfaces in compliance with Section 7.7.2 of the CSA-A23.1/A23.2 standard. Visible surfaces in completed buildings require smooth formed surfaces in accordance with Article 7.7.3.6 of the CSA-A23.1/A23.2 standard. All other surfaces require a rough formed surface in accordance with Article 7.7.2.5 of the CSA A23.1/A23.2 standard.
- .2 Fill the holes left by the form ties in compliance with Section 03 10 00 of these specifications.

3.7 CONCRETE PREPARATION

- .1 Remove and replace all damaged or defective concrete with concrete that meets the specifications and requirements of the drawings.
- .2 After the forms have been removed, the Departmental Representative shall examine all voids, honeycombs and other defects. If applicable, submit the methods for repairing the voids, honeycombs and other defects to the Departmental Representative for approval. Do not repair any of the surfaces before having received the Departmental Representative's authorization.
- .3 Wherever possible, repair formed surfaces as soon as possible after the forms have been removed.
- .4 Cover the concrete surfaces with a cement-latex slurry or an epoxy-based glue before performing concrete or mortar repairs.
- .5 The product used shall comply with Section 2.1.7 of this section.

3.8 CUTS, DRILL HOLES AND CUT-OUTS IN HARDENED CONCRETE

- .1 Components that have already been poured shall never be cut, drilled or cut-out for any reason whatsoever, unless the Departmental Representative has authorized these procedures.
- .2 Any cut, drill hole or cut-out in hardened concrete authorized by the Departmental Representative shall be performed at the specific location, using the exact dimensions he has approved. Use rotary tools that prevent the concrete from shattering.

3.9 TOLERANCES

- .1 If the tolerances specified in Article 6.4 of the CSA-A23.1/A23.2 standard have not been met during the construction of any component of a structure shown on the drawings, the Departmental Representative may require that this component be demolished and rebuilt according to the tolerances of said article, at no additional expense to the Departmental Representative.

3.10 CONSTRUCTION JOINTS

- .1 Follow the indications of Section 7.3 of the CSA-A23.1/A23.2 standard for construction joints.
- .2 The Departmental Representative shall approve the location of the construction joints that demarcate each concrete pour. If the Departmental Representative deems it appropriate, he may require that these joints be brought closer together or relocated.
- .3 None of the construction joints already indicated on the drawings shall be moved or eliminated without prior authorization from the Departmental Representative.
- .4 Immediately before resuming pouring against a construction joint or above it, clean and score the surface of the hardened concrete to eliminate all loose fragments and any trace of bleeding, moisten the surface and allow to dry to obtain saturated, dry surface conditions.
- .5 Install 80 mm thick shear keys on construction joints along the entire length/height of the component, of a width equal to one-third the thickness of the component. Slightly bevel the sides of the shear keys.
- .6 For vertical components (walls, strip footings) construction joints shall be a maximum of 20 m apart. For structural raft foundation and slabs install construction joints with maximum 20 m x 20 m spacing. Submit the location of the construction joints to the Departmental Representative.
- .7 Allow a section to cure for a minimum of 7 days before pouring a new section next to it.

3.11 ON-SITE QUALITY CONTROL

- .1 A testing laboratory designated by the Main Contractor shall inspect and test the concrete and its constituents in accordance with the CSA-A23.1/A23.2 standard.
- .2 The owner shall assume all costs for the trials.
- .3 The Laboratory shall take additional core samples during cold weather concrete work. These core samples shall be cured on site, under the same conditions as the concrete pours they represent.
- .4 Non-destructive concrete trials shall be performed according to the methods described in the CSA-A23.1/A23.2 standard.
- .5 The inspection and trials performed by the Laboratory shall not replace or finalize the quality control performed by the Contractor, nor shall they release the Contractor from his contractual obligations in this respect.

3.12 CLEANING

- .1 Provide on site, adequate space for safe washing of concrete trucks.
- .2 Dispose of waste in accordance with the requirements of provincial/territorial and federal local regulations.

END OF SECTION

DIVISION 04

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 Mine Safety and Health Administration / National Institute for Occupational Safety and Health (MSHA/NIOSH) Standards

1.2 DOCUMENTS/SAMPLES TO BESUBMITTED

- .1 Submit documents and data sheets for all cleaning products to the customer representative for review in accordance with section 01 33 00 - Documents and Samples to be Submitted.
- .2 When required, submit tools, spraygun nozzles and equipment intended for cleaning work to the customer's representative for examination.
- .3 When required, submit the results of the cleaning tests, in accordance with sections 01 33 00_documents and samples to be submitted and 01 45 00_quality control :
- .4 . 1 Perform these tests on sections to be cleaned to determine the effectiveness of low-pressure cleaning methods; test surfaces are to be determined by the customer representative; sections must be at least 2 sq. m.

 . 2 Perform these tests to determine the effectiveness of the following parameters : water pressures, waterflows, water temperatures, exposure times, nozzle types and spray distances.

 . 3 Submit two copies of the test results indicating the cleaning method, type of compressor, water pressure at the compressor, tools, nozzle dimensions, spray nozzles, and spray distance used to clean the test surfaces.

 . 4 Start cleaning after receiving written approval from the client representative for the cleaning methods tested.

1.3 QUALITY ASSURANCE

- .1 All work must be carried out in accordance with all applicable regulations.
- .2 Where required, conduct tests to verify whether brushing and spraying cleaning methods can be used as alternatives to water washing. Have the test results reviewed by the client's representative and select the method approved by the client.
- .3 Increase the amount of surfactant until an effective degree of cleaning is achieved.

- .4 Notify the customer representative at least 48 hours before beginning cleaning of test surfaces; obtain approval from the customer representative before proceeding with testing.
- .5 Discontinue work if it results in adverse impacts on surrounding structures.
- .6 Wait until instructions from the client representative regarding methods, systems, tools and equipment to be used have been received before resuming work.
- .7 Before cleaning, seal openings with a polyethylene membrane to prevent water or chemical infiltration.
- .8 Collect, neutralize and dispose of water and cleaning chemicals in accordance with the requirements of contract documents, relevant regulations and the Canadian Environmental Protection Act (CEPA).

1.4 TRANSPORT, STORAGE AND HANDLING

- .1 Transport, store and handle materials and equipment in accordance with section 01 61 00_General product requirements.

1.5 AMBIENT CONDITIONS

- .1 Do not use a wet cleaning method when there is a risk of freezing.
- .2 Do not use chemical cleaning products when the temperature is below 10 degrees Celsius
- .3 Take the necessary measures to protect the walls to be cleaned from direct sunlight.
- .4 Do not clean up if there is a risk that the sprayed chemicals may be blown away in areas to which the public has access.

1.6 EXISTING CONDITIONS

- .1 Report to the customer representative any significant deterioration of the masonry or its joints detected before and during cleaning and not indicated on the contract documents.
- .2 Record these existing conditions using photographs or videotape before and after the clean-up work. Inform the client's representative of any complications they may cause.
- .3 Do not clean deteriorated masonry surfaces without the prior approval of the customer representative.

Partie 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- .1 Use clean, contaminant-free drinking water.
- .2 Treat water with a high metal particle content before starting cleaning work.
- .3 Clean using air free of oil particles or other contaminants.
- .4 Use a polyethylene masking film and a removable and transparent thermoplastic sealant, subject to approval by the customer's representative. In the case of a prolonged spray of water such as nebulization, make sure that the protection of the openings is waterproof.
- .5 Use as neutral detergent non-ionic surfactant compounds for masonry application. Neutral detergent.
- .6 Use liquid ammonia (ammonium) based cleaning products for limestone.
- .7 Use sodium hexametaphosphate (Calgon or NaHMP) to dissolve gypsum-based soils. Use a solvent with a flash point of 60° Celsius in a jelly poultice to remove graffiti and other stains from surfaces. Use an aqueous solution for the preparation of poultices to remove copper stains, when required.
- .8 Use clean, acid-free diatomaceous earth or Atapulgit (Fuller's Earth) as a poultice base.
- .9 Use a plastic or non-ferrous material canvas as a support material for the poultice.
- .10 For finely worked surfaces, use aluminum oxide or organic grains.
- .11 To treat iron stains, prepare poultices composed of a solution of orthophosphoric acid, oxalic acid by mass and sodium salt or sodium citrate.

2.2 HOT WATER

- .1 It shall be heated to the required temperature in instantaneous steam boilers or other suitable apparatus capable of delivering temperatures up to 150° Celsius.

2.3 TOOLS AND EQUIPMENT

- .1 Use only soft bristle brushes made of natural fibres or plastic.
- .2 Use only wooden or plastic scrapers.
- .3 Perform the work using water pumps equipped with accurate pressure regulators and gauges, which can be preset and locked at the prescribed maximum pressures.

- .4 Use air compressors with integrated oil filters to avoid splashing oil onto the masonry.
- .5 Use spray nozzles with a pressure gauge.
- .6 Use apparatus with plastic or non-ferrous metal piping and fittings.
- .7 Use spray nozzles with an opening from 25° to 45°.

Partie 3 EXECUTION

3.1 PREPARATORY WORK

- .1 Install warning signs and safety devices near work areas.
- .2 Repair or seal openings and joints where there is a risk of water or chemical infiltration into the masonry.
- .3 Cover surfaces not covered by the cleaning work.
- .4 Scrape or dry brush residue deposit on adjacent walls and devices without damaging them.
- .5 Cover and protect surfaces and finishes, other than masonry, that are to be cleaned in the work area.
- .6 Provide lime covered trenches to contain acid runoff.

3.2 PROTECTION OF THE WORKS

- .1 Seal vents, windows and other openings or seal the perimeter with masking tape to prevent water infiltration.
- .2 Protect glass and metal surfaces adjacent to the surfaces to be cleaned.
- .3 Apply lime to the ground to neutralize the effects of acid products.
- .4 Provide enclosures with sheathing sheets attached to scaffolding to limit water dispersion
- .5 Protect cleaned surfaces that need to be repainted from snow and rain.
- .6 Protect finished structures from damage until the work is handed over.
- .7 Protect structures adjacent to the work from dust and dirt falling beyond the work area.

3.3 CLEANING EXECUTION

- .1 Cleaning of masonry

- .1 Pre-wetting the masonry when its degree of fouling requires it. Proceed from bottom to top.
- .2 Remove dirt by washing under moderate to high pressure, between 400 and 1400 kPa, at a flow rate of 0.25 L/s
- .3 Use a 45° nozzle and lower pressure to clean worked stone and carved masonry units.
- .4 Avoid prolonged wetting of surfaces and excessive water penetration.
- .5 Use chemical cleaning products approved by the customer representative. Observe the impregnation time recommended by the manufacturer.
- .6 Use hot water authorized for use, after testing, by the client's representative.
- .7 Do not exceed the maximum nozzle pressure or place the nozzle closer to the masonry than the distance approved by the customer representative during the tests.
- .8 Keep the nozzle at least 400 mm from the masonry, approved by the customer representative.
- .2 Brush and scrape masonry only to complete a water wash.
- . 3 Apply poultices as approved by the customer representative during testing.

3.4 CLEANING

- .1 Flush masonry to the satisfaction of the customer representative until there is no longer any evidence of chemicals.
- .2 Rinse from bottom to top, then from top to bottom.
- .3 Clean the work area as the cleaning progresses.
- .4 Once the work is completed, clean the site and return the work areas to conditions at least equivalent to their initial condition.

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)/CSA International
 - . 1 CAN/CSA A23. 1 F04/A23. 2-04, Concrete : Constituents and Performance of Work ; Test Methods and Standard Practices for Concrete.
 - . 2 CAN/CSA A179-04, Mortar and Grout for Heavy Masonry.
 - . 3 CSA A371 F04, Building Masonry.

1.2 DEFINITIONS

- .1 Stripping: removal of loose or deteriorated mortar to a maximum depth of 1/2";
- .2 Grouting: Filling and finishing masonry joints where mortar is missing.
- .3 Joint Shaping: Finishing masonry joints with appropriate tools to give them their final shape
- .4 Repair: assembly, by means of adhesives, of the various parts of a cracked or fractured masonry element.
- .5 Consolidation: Reinforcement of masonry elements to prevent deterioration (e. g. shoulders).
- .6 Cleaning with a power tool: removal of loose parts of masonry elements and joints (chips, blades, scales) with a bush hammer or other suitable power tool.

1.3 DESCRIPTION OF THE WORK

- .1 The work prescribed in this section includes, but is not limited to, the following:
 - .1 a visual inspection to identify evidence of deterioration of the masonry and examination/checking of the masonry joints;
 - .2 stripping of specified deteriorated seals;
 - .3 preparation of masonry surfaces, including cleaning joint walls, rinsing voids and bald joints and moistening masonry;
 - .4 pointing of specified masonry joints;
 - .5 removal of loose segments on the surface of stones;
 - .6 re-installation of detached masonry units;
 - .7 mortar cure;
 - .8 elimination of small voids by manual filling with grout;
 - .9 consolidation of cracked, fractured or shoulder masonry elements;
 - .10 replacement of missing or damaged masonry units.

1.4 DOCUMENTS/SAMPLES TO BESUBMITTED

- .1 Submit the required documents and samples in accordance with section 01 33 00 - Documents and Samples to be Submitted.
 - .1 Before work begins, submit, for approval, labelled samples of materials to be used for pointing and repairing masonry.

1.5 QUALIFICATION

- .1 Masonry Contractor
 - .1
 - . 1 Use a single masonry contractor for all masonry work.
 - . 2 The masonry contractor must have the relevant experience in masonry restoration of stone and brick structures.
- .2 Masons
 - . 1 Masons must hold a certificate of qualification and the relevant experience in masonry restoration of historic stone and brick structures.
 - . 2 Masons must be able to demonstrate that they are licensed to use certain proprietary restoration mortars, if required.
- .3 Cement Grout: Only workers experienced in grout handling and injection methods should work on grouting.

1.6 SAMPLES OF THE WORK

- .1 Perform the required work samples in accordance with section 01 45 00 -Quality Control.
- .2 Sample the 3'-0"; x 3'-0"; work illustrating the repair technique used in the case of each type of the prescribed material.
- .3 Conduct samples of the work under the supervision of the client's representative to demonstrate, prior to the commencement of the work, that the specified processes, techniques and assays are well understood.
- .4 Perform samples of the work at the locations indicated by the client's representative.
- .5 Allow a minimum of 3 working days for the client representative to examine the samples before proceeding with the work.
- .6 Once accepted, the samples will constitute the quality standard to be met for this work.

1.7 TRANSPORT, STORAGE AND HANDLING

- .1 Packaging, transport, handling and unloading
 - .1 Transport, store and handle materials and equipment in accordance with section 01 61 00 General Product Requirements.

- .2 Store aggregates and hydraulic binder materials in accordance with the requirements of CAN/CSA A23. 1.
- .3 Store lime paste in sealed plastic-lined drums.
- .4 Keep materials dry. Protect them from weather, freezing and any source of contamination.
- .5 Upon receipt, ensure that manufacturers' seals and labels are intact.
- .6 Remove rejected or contaminated materials from the site.
- .7 At the end of each working day, cover unprotected areas of the structure with waterproof membranes. These membranes must extend up to 0.5 m beyond the target surface and must be installed in such a way as to form a waterproof barrier to prevent the finished structure from drying too quickly.
- .8 Protect adjacent finished surfaces from damage that may be caused by work in progress.
- .2 Waste management and disposal
 - .1 Sort waste for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.8 EXISTING CONDITIONS

- .1 Note any areas of deteriorated masonry identified during the work and inform the customer representative in writing. Wait for instructions from the latter before replacing or repairing the masonry units concerned.

1.9 ENVIRONMENTAL CONDITIONS

- .1 Maintain the temperature of the masonry structure between 10 and 25 degrees Celsius throughout the work.
- .2 Ambient temperature of at least 10 degrees Celsius
 - .1 Store cement and sand for immediate use in heated enclosures and allow these materials to reach a temperature of at least 10 degrees Celsius.
 - .2 Heat and maintain water at a temperature of at least 20 degrees Celsius and at most 30 degrees Celsius:
 - .1 When laying the mortar, its temperature must be at least 15 degrees Celsius and at most 30 degrees Celsius.
 - .2 Do not mix cement with water, aggregates or a water-aggregate mixture with a temperature above 30 degrees Celsius.
 - .3 Maintain aggregates at a temperature between 10 and 30 degrees Celsius.
 - .4 Keep the mortar at a temperature between 10 and 40 degrees Celsius.
 - .5 In cold weather, heat water to a maximum of 90 degrees Celsius.

Partie 2 PRODUCTS

2.1 MATERIALS

- .1 Jointing mortar : based on GU hydraulic cement, type S hydrated lime and calibrated sand; properties in accordance with CSA A179-04 for type O mortar. Color to match the existing.
- .2 Drinking water.

Partie 3 EXECUTION

3.1 VERIFICATION OF EXISTING CONDITIONS

- .1 Prepare a written report to the client representative indicating any deteriorated areas of the masonry that have not already been identified.
- .2 Before commencing work, obtain written approval and instructions from the customer representative for the repair and replacement of masonry units.
- .3 Discontinue work if mould is detected and immediately report the problem to the client representative.

3.2 REVIEW/AUDIT

- .1 Verification method: Perform a visual inspection to identify signs of deterioration of the masonry.
- .2 Then check the joints that do not appear to be damaged as follows.
- .3 Check for voids or weaknesses using a hammer or other approved means to mark unhealthy joints and record their location.

3.3 MASONRY REPAIR

- .1 Perform work in accordance with CSA-A371.
- .2 Refer to section 04 05 00 - Masonry- General Requirements for Work Results. For information on the requirements for the protection of structures.

3.4 JOINT STRIPPING

- .1 Use an appropriate tool to remove the deteriorated mortar to a depth of 1/2", so as to create a right-angled gap with a flat bottom wall. Clean up voids and cavities encountered.
- .2 Avoid shouldering, altering or damaging masonry elements during joint stripping operations.

- .3 Clean joint surfaces with moderate water washing, taking care not to alter the texture of masonry units or exposed joints.
- .4 Rinse voids and bald joints, remove them with a low pressure water jet, and if the water does not flow freely, use a compressed air jet to thoroughly clean them.
- .5 Eliminate any water accumulation.

3.5 REPOINTING

- .1 Moisten the joints.
- .2 Keep masonry wet during pointing.
- .3 Completely fill the joints with mortar. If the edges of the masonry units are worn and rounded, redo the joints set back from the surface of the units to maintain the same joint width, taking care not to thin the mortar layer at the edges. Then compact the mortar firmly by removing voids.
- .4 Compact the mortar in the joints with a joint iron and shape the joints.
- .5 Repeat the joints in layers not exceeding 1/2" in thickness, and allow each layer to set before applying the next. Ensure that the joints have a uniform width over their entire depth.
- .6 Shaping the joints to match the old ones and according to the instructions of the customer representative.
- .7 Remove mortar burrs from the surface of masonry units before they dry.

3.6 REPLACEMENT OF DETACHED MASONRY UNITS

- .1 Secure the replaced masonry units in the proper position with hard wood corners.
- .2 Introduce the firm mortar and compress to a depth of 50 mm from the surface of the joint. Allow the mortar to set for at least 24 hours.
- .3 Remove wooden corners when they are dry and have shrunk.
- .4 Grout to the face of the elements with two coats of mortar.

3.7 CLEANING

- .1 As the work progresses, remove mortar burrs, stains and any other contamination resulting from the work prescribed and provided for in this contract.
- .2 Remove spills and mortar burrs with a clean sponge and water.

- .3 Continue cleaning with a natural fiber rigid bristle brush after the initial setting of the mortar but before it has completely cured.
- .4 Clean masonry components with clean water and a natural fibre rigid bristle brush only when the mortar has completely cured.
- .5 Clean masonry with a soft natural fibre bristle brush and clean water at a pressure of 15 to 45 psi.
- .6 Obtain approval from the client representative before using other methods to clean up persistent stains.

3.8 PROTECTION OF FINISHED WORKS

- .1 At the end of each working day, cover completely or partially completed structures that are not protected by an enclosure.
- .2 Use impermeable tarpaulins to cover structures to prevent erosion of pointing materials by weather.
 - .1 Keep the tarpaulins in place for two (2) weeks after completion of the repointing work.
 - .2 Ensure that air can circulate under the tarpaulins.
- .3 Secure the tarpaulins in place.
- .4 Install wet protective cloths on repointed masonry structures and keep them in place throughout the cure period.
 - .1 Cure period must be at least seven(7) days in summer.
 - .2 Cure period must be at least 30 days in cold weather, and heated enclosures must be used.
- .5 Wet the canvas with a water sprayer only. Make sure that water is never sprayed directly onto the mortar joints.
- .6 Protect work areas from direct sunlight during periods when the temperature is above 25 degrees Celsius and keep the protective covers always moist.
- .7 Maintain an ambient temperature of 10 degrees Celsius for at least four (4) weeks after completion of the pointing work.

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C144-04, Standard Specification for Aggregate for Masonry Mortar.
- .2 Canadian General Standards Board CGSB)
 - .1 CAN/CGSB 75. 1 M88, Ceramic Tiles.
- .3 Canadian Standards Association (CSA)/CSA International
 - .1 CAN/CSA A3000 F03(C2006), Compendium of Cementitious Materials(Contains A 3001, A3002, A3003, A3004 and A3005).
 - .2 CAN/CSA A179 F04, Mortar and Grout for Heavy Masonry.

1.2 DEFINITIONS

- .1 Stone repair: mechanical or plastic repair work, intended to restore the appearance and initial properties of partially deteriorated stones.
- .2 Restoration mortar: filler material used to restore broken or damaged parts of stones.
- .3 Adhesive: material used to glue the different parts of fractured / cracked stones, applied directly to the faces exposed by the crack or fracture or to separately applied reinforcing elements, such as studs.
- .4 Grouting mortar: material used to grout mortar joints adjacent to repaired stones.

1.3 DOCUMENTS/SAMPLES TO BE SUBMITTED

- .1 Submit the required data sheets and samples in accordance with section 01 33 00_documents and samples to be submitted.
- .2 Provide, at the request of the customer's representative, purchases slips, invoices, certificates of tests performed by the supplier and all other documents necessary to establish the conformity of the materials used with the requirements of the specifications. Allow free access to the source of supply of materials.

1.4 QUALITY ASSURANCE

- .1 Samples of the work:
 - .1 Perform the required work samples according to section 01 45 00_quality control.

- .2 Perform, according to the method sand using the prescribed materials, a sample of at least 300mm x 300mm of a facing repair.
- .3 Do not use a facade cladding to make the sample.
- .4 Allow at least three days for the representative to examine the sample before starting the work.
- .5 Once accepted, the sample will be the quality standard to be met for this work.

1.5 TRANSPORT, STORAGE AND HANDLING

- .1 Perform these operations in accordance with section 01 61 00_General product requirements.
- .2 Keep materials dry and protect them from weather, freezing and any source of contamination ; store them in a dry place and so that they do not rest on the ground.
- .3 Follow the manufacturer's instructions and recommendations for mixing, applying and curing mortars.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort waste for recycling in accordance with section 01 74 21_management and disposal of construction and demolition waste.

1.7 ENVIRONMENTAL CONDITIONS

- .1 Maintain a temperature of at least 10 degrees Celsius for stone and materials during repair work and for the next 48 hours.
- .2 Protect repairs from sun and wind when temperature is above 20°Celsius; do not use repair mortar when temperature is above 30 °Celsius.
- .3 Ensure that the epoxy resin used is compatible with the moisture conditions of the stone, according to the manufacturer's instructions.
- .4 When required, provide and install temporary enclosures and heating equipment required to maintain minimum required temperatures; do not overheat masonry.
- .5 Comply with the environmental requirements for the products used, according to the manufacturer's instructions.

Partie 2 PRODUCTS

2.1 MATERIALS

- .1 Water: Drinking, clean and free of contaminants.
- .2 Sand: washed, clean and of particle size in accordance with ASTM C144.

- .3 Adhesive: Epoxy resin mixture.
- .4 Bolts: stainless steel, diameter required according to the intervention.
- .5 Slotted wire: stainless steel, diameter required depending on the procedure.
- .6 Specialized mortar for limestone restoration: dry, patented, premixed and pre-coloured formula, based on cementitious compounds and mineral fillers, without acrylic, latex or synthetic polymer additives.
- .7 Jointing mortar: based on GU hydraulic cement, type S hydrated lime and calibrated sand; properties in accordance with CSA A179-04 for type O mortar.

Partie 3 EXECUTION

3.1 VERIFICATION OF EXISTING CONDITIONS

- .1 Report in writing to the customer representative any deterioration of the stone masonry that has not already been identified in the documents, within the scope of the work.
- .2 Discontinue work if contaminants are present and report them to the client representative.

3.2 PREPARATORY WORK

- .1 Remove the deteriorated part of the stone until the healthy surface appears, using gentle methods.

3.3 PROTECTION

- .1 Protect adjacent walls and structures from damage; repair damage if necessary.

3.4 REPAIR OF FRACTURED STONES

- .1 Drill holes of appropriate diameter and depth in each piece of stone on either side of the fracture.
- .2 Insert studs of appropriate diameter and length into the holes, and apply the prescribed adhesive in the holes and on both sides of the fracture plane. Assemble the elements. Allow the adhesive to cure for at least 72 hours.
- .3 Replace the repaired stone in the masonry structure and repoint with the appropriate mortar. The joints must be in harmony with those of the rest of the structure.

- .4 Have the repair method approved by the customer representative before starting the work.

3.5 RECONSTITUTION OF THE FACING FACE OF A STONE USING RESTORATION MORTAR

- .1 Remove accumulated dust from the cavity and wet the walls.
- .2 Bush the stone to form grooves in the cavity.
- .3 Gradually reconstitute the stone by applying successive layers of mortar with a thickness recommended by the manufacturer; allow the mortar to cure for at least 72 hours between each layer.
- .4 Use a wooden float, avoiding over-smoothing, to prevent the mortar from cracking.
- .5 Coarsely shape the mortar with the float to the desired shape; then give it the final shape with a chisel once it has hardened.
- .6 Remove laitance with a slightly damp stiff bristle brush.
- .7 Cover repaired stones with damp cloths and moisten them from time to time for several days.
- .8 Grout with the prescribed grouting mortar. The joints must be in harmony with those of the rest of the structure.

3.6 REPAIR OF MORTAR JOINTS

- .1 Repair all damaged joints as per section 04 03 05. 21_rejointing existing masonry.

3.7 CLEANING

- .1 Perform cleaning work in accordance with section 01 74 11_cleaning.
- .2 Before commencing cleaning work, obtain approval from the client's representative for the cleaning method to be used.
- .3 Protect the adjacent floor from excessive accumulation of cleaning water.
- .4 Clean masonry surfaces after repairs are completed and mortar has hardened.
- .5 Remove any adhesive or mortar from masonry surfaces resulting from the work, without damaging stones or joints.
- .6 Remove debris, excess materials and equipment from the site. Leave the site clean and tidy, so that it does not present any hazards.

3.8 PROTECTION OF THE FINISHED WORK

- .1 For a period of two (2) weeks after completion of the work, take the necessary measures to protect the finished work from damage by impact.

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C97-02, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
 - .2 ASTM C170-90(1999), Standard Test Method for Compressive Strength of Dimension Stone.
 - .3 ASTM C568-03, Standard Specification for Limestone Dimension Stone.
- .2 Canadian Standards Association(CSA)/CSA International
 - .1 CAN/CSA A179-04, Mortar and Grout for Heavy Masonry.

1.2 DEFINITIONS

- .1 She-wolf: Device for gripping and lifting cut stones, by spreading a jaw or blocking corners in a dovetail cavity, called a she-wolf hole.
- .2 Happe : A metal device with one or more points or curved ends used to secure two adjacent parts or elements; spike, claw.

1.3 DOCUMENTS/SAMPLES TO BESUBMITTED

- .1 Submit documents, replacement stone samples and shop drawings required in accordance with Section 01 33 00 - Documents and Samples to be Submitted.
 - .1 Submit shop drawings describing the method of stone removal, if required.
 - .2 Workshop drawings submitted must bear the seal and signature of a competent professional recognized or authorized to practice in Quebec.
- .2 Submit replacement stone samples as required 45 working days prior to the start of construction.
- .3 Submit replacement limestone samples according to the following requirements:
 - .1 2 samples of 300mm x 300mm x300mm x 50mm for the compressive strength test according to ASTM C170.
 - .2 A 300mm x 300mm x 300mm x12mm sample for the porosity test according to ASTM C97.
- .4 Submit mortar samples in the quantities and dimensions prescribed in CAN/CSA A179.

- .5 Provide maintenance records for masonry structures and attach them to the manual referred to in section 01 78 00 - Documents and samples to be provided upon completion of the work.

1.4 QUALITY ASSURANCE

- .1 Provide the client representative with access to the mason's shop for inspection of work in progress.
- .2 Ensure that the work covered by this section is performed by qualified stone masonry workers.
- .3 Masons hired by the masonry contractor must have a minimum of 5 years experience in restoring stone masonry structures.
- .4 The customer representative may refuse a mason who cannot establish that he has the necessary experience and skills; refer to section 01 61 00 - General Product Requirements.
- .5 Each mason employed at any time in this project must meet the above requirements. Any mason hired to replace a mason leaving the initial team must also meet these requirements.
- .6 Perform the required work samples in accordance with section 01 45 00 - Quality Control.
- .7 At the end of each work day, cover completely or partially finished walls that are not protected by an enclosure with impermeable tarpaulins. Stretch the tarpaulin on the wall, over hanging it by 500 mm on each side and secure it securely. Do not dry the structures too quickly.
- .8 Protect adjacent structures from any markings or damage resulting from the work.
- .9 Temporarily support masonry structures to support them during and after the work, until the permanent provides adequate bracing.

1.5 TRANSPORT, STORAGE AND HANDLING

- .1 Packaging, transport, handling and unloading
 - .1 Transport, store and handle materials and equipment in accordance with section 01 61 00 General Product Requirements.
- .2 Waste management and disposal
 - .1 Sort waste for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .3 Apply unused mixed mortar to designated areas where this mortar, with lower mechanical strength, can meet the requirements as a bulk filler material, e. g. as a footings ballast for retaining wall, ground level cavity filler, cradles or anchoring blocks for buried piping.

Partie 2 PRODUCTS

2.1 MATERIALS

- .1 Limestone: Geological name: *Indiana Limestone* type; in accordance with ASTM C568.
- .2 Facing faces shall be hammered to a finish identical to that of the adjacent facing to be retained.
- .3 Existing limestone stones removed and reinstall to their original location

2.2 CARACTÉRISTIQUES DE LA PIERRE

- .1 Stratification: low; bedding plane corresponding to 15% of the size plane.
- .2 Density: 2.6
- .3 Water absorption capacity (cold): 0.69
- .4 Water absorption capacity (hot): 0.72
- .5 Compressive strength: 101.8 MPa.

2.3 ANCRAGES, ATTACHES ET PRODUITS D'ÉTANCHÉITÉ

- .1 Anchors, catchers and studs: 302 or 304 grade stainless steel. The anchor specifications must be signed and sealed by an OIQ member structural engineer.

MORTAR

- .2 Mortar based on GU hydraulic cement, type S hydrated lime and calibrated sand, which meets the properties prescribed by CSA Standard A179-04 for a type N mortar, it contains an air entraining agent and a colorant. Color to match the existing
- .3 Drinking water.

Partie 3 EXECUTION

3.1 VERIFICATION OF EXISTING CONDITIONS

- .1 Prepare, for the client representative reporting any deteriorated areas of masonry that have not already been identified.
- .2 Before commencing work, obtain the approval of the customer representative and instructions for the repair and replacement of masonry units.
- .3 Discontinue work if mould is detected and immediately report the problem to the client representative.

3.2 PREPARATORY WORK

- .1 Ensure the natural aging of the stones for a period of six (6) months, or during the period specified by the customer's representative. Ensure that they cannot absorb soil moisture and protect them from water accumulation. Allow the stones to age on their natural base.
- .2 Move and lift stones by taking the necessary measures to prevent damage. Have the customer's representative inspect and approve stones that have been struck or dropped. Do not drill holes or make recesses to receive wolves, catchers, retaining hooks or other lifting devices on the facing face or upper bed face of the stones.
- .3 Indicate the direction of stone bedding. Reproduce the marks indicating the direction of the seat on the usable cut stone fragments.
- .4 Install safety devices and warning signs in the vicinity of the work area, as per instructions in section 01 56 00 Temporary Access and Protection Structures.
- .5 If required, install and remove props and brackets in accordance with the structural engineering specifications.
- .6 Install and remove self-supporting scaffolds in accordance with section 01 52 00 Site Installations.
- .7 Protecting adjacent sensitive surfaces.

3.3 STONE REMOVAL

- .1 Degarnish mortar joints around cracked stones indicated at elevations.
- .2 Remove loose fragments from deteriorated facings.
- .3 Remove dust and mortar or stone particles from the spaces to be filled

3.4 STONE SIZE CUTTING

- .1 Use a compass, square and level to measure the space to be filled. Provide mortar joints from 9mm to 13mm thick.
- .2 Give the upper bed face of the stones a 1:10 downward slope towards the facing face.

3.5 STONE MOVEMENT

- .1 Use whips of catchers/hooks or other similar devices to lift stones to the required height for the work to be performed.
- .2 Move stones horizontally on carts.
- .3 Slide the stones onto wooden ramps to place them.
- .4 Avoid damaging the edges of the stones during lifting operations. Use wooden separators or shims to disengage them from the lifting belts; use only undamaged stones.

3.6 STONE REPLACEMENT

- .1 Before placing a stone, wash it with water and a natural bristle brush.
- .2 Moisten the surfaces of the spaces to be filled and apply the bedding mortar.
- .3 Lay heavy and protruding stones once the mortar in the under lying rows has hardened sufficiently to support its weight.
- .4 Seal and anchor protruding stones until the upper rows have sufficiently hardened.
- .5 Place large stones on water-soaked soft wood corners to keep the stones in line until the mortar has hardened. When they are dry, remove the corners without breaking them.
- .6 As work progresses, sponge along the joints to remove mortar burrs and remove mortar stains from the stone face before setting.
- .7 Install anchors, studs, wedges and spikes. Use non-corrosive metal anchors to secure the stone facing plates as indicated.
- .8 Lay the level, plumb and square stones as shown in the drawings on a generous layer of mortar, ensuring that the vertical joints are of equal thickness on both sides, unless otherwise indicated. Completely fill the drilled holes for anchors, studs and lifting devices as well as the voids left by the straightening of overhanging edges.

3.7 FILLING AND GROUTING

- .1 Fill the joints and grout the masonry in accordance with section 04 03 05.21_Period Masonry Repointing.

3.8 REPOINTING

- .1 Moisten the masonry and keep it moist for the duration of the joint.
- .2 Completely fill the joints with mortar. If the edges of the masonry units are worn and rounded, redo the joints set back from the surface of the units to maintain the same joint width, taking care not to thin the mortar layer at the edges. Then compact the mortar firmly by removing voids.
- .3 For protection, maintain the temperature of the masonry between 5 and 25 degrees Celsius during the work in accordance with section 04 05 00_Common Work Results For Masonry.
- .4 Repeat joints in layers not exceeding 12 mm deep, and allow each layer to set before applying the next. Ensure that the joints have a uniform width over their entire depth.
- .5 Shape the joints to match the old ones and according to the instructions of the customer representative.
- .6 Remove mortar burrs from the surface of masonry units before they dry.

3.9 CLEANING

- .1 Perform cleaning work in accordance with section 01 74 11 - Cleaning.
- .2 Before starting the cleaning of the finished work, confirm the acceptance by the client's representative of the previously demonstrated cleaning method.
- .3 Protect plants and adjacent soil from any accumulation of cleaning water.
- .4 Clean masonry surfaces after repair work is complete and the mortar has hardened.
- .5 Remove burrs and mortar residue from masonry surfaces resulting from work without damaging stones or joints.
- .6 Once completed, remove debris, excess materials and equipment from the site. Leave the site clean and tidy, so that it does not present any hazards.

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 TRANSPORT, STORAGE AND HANDLING

- .1 Transport, store and handle materials and equipment in accordance with section 01 61 00 General Product Requirements
- .2 Protect the stones to be replaced and take the necessary measures to facilitate their replacement.
 - .1 Store masonry units removed from the structure on wooden pallets in a locked enclosure and protect them from water, weather and any potential mechanical damage.
 - .2 Submit the storage and identification system to the client representative for review.
- .3 Waste management and disposal
 - .1 Sort waste for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.2 RANKING

- .1 Stones and other elements that must be placed else where in the structure when re-installed shall be numbered on drawings or photographs.
- .2 Mark the following:
 - .1 stones and other elements or components, for identification and reinstallation;
 - .2 wooden platforms and other equipment used for the transport and storage of stones;
 - .3 work and storage areas;
 - .4 places where stones have been removed, on drawings or photographs
- .3 Prepare a table or file to identify elements or stones as required, and to verify the availability of platforms and work and storage areas.
- .4 Keep the table or file up to date, and make a daily copy if necessary.
- .5 Ensure that the table or file contains the relevant information, as indicated on the model on the drawings, see plans.
- .6 Upon request, submit updated copies of the table or file, as well as chronological information for each of the numbered elements (individual element sheets).

Partie 2 PRODUCTS

Partie 3 EXECUTION

3.1 EXAMEN

- .1 Examine masonry surfaces and transit and storage areas.

3.2 VERIFICATION OF EXISTING CONDITIONS

- .1 Prepare, for the client representative reporting any deteriorated areas of stone masonry that have not already been identified in the documents. Before starting the work, obtain the approval of the customer representative and instructions from the customer representative for the repair and replacement of masonry units.
- .2 Discontinue work if mould is detected and immediately report the problem to the client representative.

3.3 PREPARATORY WORK

- .1 Remove damaged parts of the stones until the healthy surface appears, using gentle methods.
- .2 Remove damaged parts of the stones with an appropriate tool.
- .3 Before commencing the work, obtain approval from the client representative for any alternative method and tools proposed to be used to perform the work.
- .4 Remove dust and loose particles from the stones.

3.4 PROTECTION OF STRUCTURES

- .1 Protect from damage the building, fences, trees, landscaping, natural features, paved surfaces, and utilitylines, which must remain in place. If necessary, repair the damage.
- .2 Protect other surrounding surfaces and structures from damage that may result from the work.
- .3 Have the method of stone repair approved by the customer representative.

3.5 PROVISIONAL MARKING AND PREPARATION OF A FILE

- .1 Before removal, mark the stones on their facing face with a marking material that can be completely erased, if necessary, without damaging the masonry unit; for this purpose, use the following:
 - .1 a ballpoint pen and make the marking on a diachylon that will be affixed to the stone;

- .2 a wax-free crayon and mark directly on the stone.
- .2 Create a photographic record of the work to be dismantled and rebuilt.
- .3 Use the numbering/markings/positioning system shown on the plans.
- .4 Ensure that the temporary markings will withstand weathering, handling and cleaning, and will last until the stones are finally marked.
- .5 Ensure that marks and adhesives can be removed with a vegetable fibre brush, used dry or with water, without damaging the masonry units. Do not use solvents, acids or other chemicals.

3.6 SUPPORTING

- .1 Construct the props, cradles and other temporary elements necessary to support the structure, or parts thereof, during dismantling and pending reinstallation, if the structure is not to be completely dismantled into a structure according to approved drawings bearing the seal and signature of a qualified engineer experienced in masonry structures and qualified to practice in Quebec.

3.7 UNSEALING OF STONES

- .1 To unseal stones, use approved methods that do not cause damage to stones or other architectural elements.
- .2 Use hand tools only. If necessary, have the use of power tools approved by the customer's representative before beginning the unsealing work.

3.8 SPECIAL TECHNIQUES

- .1 Avoid damaging the edges of stones when stripping joints and loosening masonry units.
- .2 Use wooden corners as necessary to remove or dislodge stones.
 - .1 Use flat towers covered with shockabsorbing material (canvas, cardboard).
- .3 Use nylon lifting belts, at least two (2) per stone.
- .4 Use wooden separators or shims to prevent the lifting belts from damaging the edges of the stones as they are lifted from their position or handled along the wall.
 - .1 If the stones are damaged, repair them in accordance with section 04 03 41 - Historic Structures - Repair of Stones in accordance with the specified method

3.9 HANDLING

- .1 Place removed stones on wooden surfaces during handling, preventing contact with metal.
- .2 When the stones are down to ground level, place them directly on the wooden platforms that will be used for transportation or storage.

- .3 Transport and store stones on wooden pallets.
- .4 Ensure that the sharp edges of the stones do not touch any hard objects.

3.10 TEMPORARY STORAGE / TRANSIT AREA

- .1 Before storage, place the stones in the designated area of the site for cleaning, detailed examination and final marking.
- .2 Ensure that the stones are accessible and arranged so that they can be easily retrieved if necessary.
- .3 When stones are placed under a shelter, the shelter shall be properly ventilated and designed to retain any condensation water that may form on its interior walls.

3.11 CLEANING

- .1 Clean when the temperature is above freezing. After cleaning, protect wet stones from freezing until they are dry.
- .2 Unless otherwise instructed by the customer representative, use a vegetable fibre brush and water to clean the stones.
- .3 Remove mortar burrs with appropriate tools.

3.12 FINAL MARKING

- .1 Perform final marking after cleaning on a surface that provides both good adhesion and legibility and will not be visible after the stones have been replaced.
- .2 The colour and size of the inscriptions shall be such that the marking is legible from a distance of 2 m.
- .3 Ensure that the product used for marking will not compromise the adhesion of the mortar to the stone when re-installed.
- .4 Ensure that the product used for marking will not fade during storage and will resist until the stones are replaced. Stones can take several years to store, and further cleaning may be required before they are replaced.

3.13 CHEMICAL TREATMENT

- .1 .Perform chemical cleaning in accordance with section 04 03 06 -Cleaning of masonry.

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)/CSA International.
 - .1 CSA A165 Series F94(C2000), CSA Standards for Concrete Masonry Units.
 - .2 CSA A179 F94 (C1999), Mortar and Grout for Heavy Masonry.
 - .3 CSA A371 F94 (C1999), Building Masonry.

1.2 DOCUMENTS/SAMPLES TO BE SUBMITTED

- .1 Technical data sheets
 - .1 Submit the required data sheets as well as the manufacturer's products specifications and documentation in accordance with section 01 33 00 Documents and samples to be submitted.
- .2 Samples
 - .1 Submit the required samples in accordance with section 01 33 00 Documents and samples; construct them in accordance with section 01 45 00 Quality Control.
 - .2 Submit samples that have been laboratory tested by recognized technicians with the necessary knowledge of masonry element testing.
 - .3 Samples are used to evaluate the use of materials, the quality of workmanship, the preparation of the substrate and the operation of the equipment.
 - .4 Allow 24 hours for the client's representative to examine the samples before starting the work.
 - .5 Once accepted by the client's representative, the samples of the work will constitute the minimum standard to be met with respect to the work maybe part of the finished work.
- .3 Manufacturer's instructions
 - .1 Submit implementation instructions provided by the manufacturer.

1.3 QUALITY ASSURANCE

- .1 Test reports
 - .1 Submit test reports certifying that products, materials and equipment meet the physical characteristics and performance criteria requirements.
 - .2 Submit laboratory test reports certifying that the masonry elements and mortar components meet the requirements.

- .2 Certificates: submit documents signed by the manufacturer, certifying that the products, materials and equipment meet the physical characteristics and performance criteria requirements.
- .3 Pre-implementation Meeting: Hold a meeting to review the work requirements, the manufacturer's instructions for implementation and the terms of the manufacturer's warranty.

1.4 TRANSPORT, STORAGE AND HANDLING

- .1 Transport, store and handle equipment and materials in accordance with section 01 61 00 General Product Requirements.
- .2 Materials delivered to the site must be dry.
- .3 Protection and storage:
 - .1 Keep materials dry until ready for use, except when required to be moistened.
 - .2 Store materials away from the weather, on pallets or platforms placed on planks or sections of planks so that they do not rest directly on the ground.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort and recycle waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 CONDITIONS OF IMPLEMENTATION

- .1 Environmental conditions and environment.
 - .1 Implementation in cold weather.
 - .1 Comply with the following requirements in addition to the requirements of paragraph 5. 15. 2. of CSA A371.
 - .1 Maintain the mortar at a temperature of at least 5°C until the batch is used or stabilized.
 - .2 Maintain ambient temperature at least 5°C and protect from wind chill.
 - .2 Implementation in hot weather.
 - .1 Cover with a waterproof tarpaulin that does not stain newly constructed masonry so that it does not dry too quickly.
 - .2 Until masonry structures are completed and protected by flashing or other permanent construction, keep them dry with impermeable, non-staining tarpaulins, which should be extended beyond the top and sides of

the structures for a sufficient distance
to protect them from wind-driven rain.

Partie 2 PRODUCTS

2.1 MATERIALS

- .1 See other sections of Division 4.

Partie 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with the manufacturer's written requirements, recommendations and specifications, including technical bulletins and installation instructions specified in product catalogues and on packaging cartons, as well as indications in the technical data sheets.

3.2 PREPARATORY WORK

- .1 Temporarily brace masonry structures during and after installation work until permanent lateral supports are in place.
- .2 Bracing must be approved by the client representative.

3.3 GENERAL INFORMATION

- .1 Unless otherwise specified, perform masonry work in accordance with CSAA371.
- .2 Perform plumb, level and alignment masonry work, making well aligned vertical joints.
- .3 Arrange the rows of bricks according to the prescribed apparatus and in such a way as to obtain seats of appropriate height and to maintain the continuity of the apparatus above and below.

3.4 IMPLEMENTATION

- .1 Exposed masonry structures.
 - .1 Remove chipped, cracked or otherwise damaged components from exposed structures in accordance with Clause 82. 1 of CSA Standard A-165 and replace them with components in good condition.
- .2 Grouting.
 - .1 When concave joints (half round or groove) are required, allow the mortar to harden sufficiently to remove excess water, but no more, then back up with around joint iron to make smooth, aligned, well packed and uniformly concave joints.

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- .2 Where slit joints are required, allow the mortar to harden sufficiently to remove excess water, but no more, then scrape the joints uniformly using a square joint iron to compress the mortar and make smooth, tightly packed joints with a uniform depth of 6 mm.
 - .3 Perform flush joints (drawn in at the base) for all concealed wall joints or joints intended to be covered with plaster, tile, insulation or any other similar material, except paint or thin film finish of the same type.
 - .3 Size.
 - .1 Cut masonry units where switches, electrical outlets or other recessed or recessed elements are to be installed.
 - .2 Make clear, square and free of uneven edges.
 - .4 Flush mounting.
 - .1 Embedding elements to be incorporated into masonry structures.
 - .2 Prevent the recessed elements from moving during construction work. As the work progresses, check the plumbing, alignment and position of these elements frequently.
 - .3 Bracing the door jambs so that they remain plumb. Fill the spaces between the masonry and the uprights with mortar.
 - .5 Brick wetting
 - .1 Except in cold weather, wet bricks with an initial absorption rate greater than 1 g/min per 1000 mm² area; wet these bricks until a uniform degree of saturation is achieved, 3 to 24 hours before installation, and do not lay them until their faces are dry.
 - .2 After a work interruption, dampen the top of brick walls requiring wetting.
 - .6 Supporting elements.
 - .1 Where blocks filled with in-situ concrete are to be used instead of solid blocks, place concrete in accordance with section 03 30 00 in-situ concrete.
 - .2 Where grout filled blocks are to be used instead of solid blocks, use grout conforming to CSA A179.
 - .3 Place construction paper under the voids to be filled with grout; place the construction paper 25 mm away from the face of the blocks.
 - .7 Movement of masonry elements.
 - .1 Leave a 3 mm gap under the support angles.
 - .2 Leave a 6 mm gap between structural members and the top of non-load bearing partitions and walls; do not place shims.
 - .3 Construct masonry structures to incorporate stabilizers and provide for vertical movement of masonry prior to installation.
 - .8 Non-attached steel lintels.

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- .1 Install non-attached steel lintels over the bays; center them in relation to the width of the bays.
 - .9 Splitting joints.
 - .1 Perform the required continuous splitting joints.
 - .10 Expansion joints.
 - .1 Perform the required continuous expansion joints.
 - .11 Connecting to other structures.
 - .1 Cut openings in existing structures indicated.
 - .2 Any openings in the walls must be approved by the client's representative.
 - .3 Rehabilitate existing structures using materials corresponding to those used for their construction.
 - 3.5 IMPLEMENTATION TOLERANCES**
 - .1 The tolerances specified in the notes to Clause 5. 3 of CSA A371 apply.
 - 3.6 ON-SITE QUALITY CONTROL**
 - .1 Inspection and testing will be performed by the test laboratory designated by the client's representative.
 - 3.7 CLEANING**
 - .1 Once the work is completed, cleanup the site to remove dirt and debris accumulated during construction and the environment.
 - .2 Once work is completed, remove excess materials, waste materials, tools and safety barriers from the site.
 - 3.8 PROTECTION OF STRUCTURES**
 - .1 Protect masonry structures from marks, mortar burrs and other damage. Use protective tarpaulins that do not stain.

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)/CSA International.
 - .1 CSA A179 94(C1999), Mortar and Grout for Heavy Masonry.

1.2 DOCUMENTS/SAMPLES TO BESUBMITTED

- .1 Technical data sheets
 - .1 Submit the required data sheets as well as the manufacturer's product specifications and documentation in accordance with section 01 33 00 Documents and samples to be submitted.
- .2 Samples
 - .1 Submit the required samples in accordance with section 01 33 00 Documents and samples to be submitted.
 - .2 Submit two strips of coloured mortar samples, measuring at least 6"; long
- .3 Manufacturer's instructions
 - .1 Submit installation instructions provided by the manufacturer.

1.3 QUALITY ASSURANCE

- .1 Test reports: submit test reports certifying that products, materials and equipment meet the physical characteristics and performance criteria requirements.
 - .1 Submit laboratory test reports as per section 01 29 83 - Payment - Testing Laboratory Services.
- .2 Certificates: submit documents signed by the manufacturer, certifying that the products, materials and equipment meet the physical characteristics and performance criteria requirements.
- .3 Pre-implementation Meeting: Hold a meeting to review the work requirements, manufacturer's installation instructions and the terms of the manufacturer's warranty.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort and recycle waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Partie 2

PRODUCTS

2.1

MATERIALS

- .1 Same brand materials and aggregates from the same source of supply shall be used for all work.
- .2 Mortars and grouts: in accordance with CSA A179.
- .3 Aggregates: when 6 mm thick joints are specified, the aggregate used must pass through the 1. 18 mm sieve.
- .4 Colouring agent: colored and ground natural aggregates, or metal oxide pigments, compatible with mortar by-products ; proportion of dyestuffs of not more than 10% by weight of cement content.
- .5 Mortar components :
 - .1 Lava sand, clean, dry, free of plant or organic matter, moisture content between 0 and 5%, in accordance with CSA Standard A82-56 M .
 - .2 Water, potable, clean, free of plant and organic particles.
 - .3 Dry masonry cement, in accordance with CSA CAN3-A8M standard.
 - .4 Portland cement with a low alkali content, in compliance with AGNORCAN3-A5M standard.
 - .5 Hydrated lime in accordance with ASTM C207-79(1984).
- .6 Mortar for foundation walls and other exterior masonry structures at or below ground level : Type M mortar, as specified in the specifications.
- .7 Mortar for stone masonry works:
 - .1 pre-mixed type N mortar
 - .2 based on hydrated lime, Portland cement and sand, in accordance with the specifications of Agnor standard A179-M1976
 - .3 unless otherwise specified, in accordance with the specifications relating to characteristics, dosage and recommendations of the masonry manufacturer
 - .4 volume dosage: 1 Portland cement, 1 hydrated lime, 4. 5 to 6 sand.
- .8 Reinforced masonry mortar, grouted: Type S and M mortar, as specified in the specifications.
- .9 Coloured mortar: incorporate a colouring agent into the mortar, at a maximum of 10% of the cement content, by mass, or use coloured masonry cement in the mass to obtain mortar of the same colour as the approved sample.
- .10 Non-staining Mortar: When required, use non-staining masonry cement as a hydraulic binder.

- .11 Grout: Compliant with CSA A179, Table 3.

2.2 MIXINGS

- .1 Colouring agent: prepare a grout with a semi-liquid consistency.
- .2 Coloured mortar: incorporate colouring agents into the mixture according to the manufacturer's instructions; use a clean mixer to prepare coloured mortar.
- .3 Grouting mortar: Pre-moisturize the grouting mortar by first mixing the dry ingredients; continue mixing by adding just enough water to obtain a wet mass that is difficult to handle and keeps its shape when made into a ball. Let stand for at least 1 hour but not more than 2 hours, then mix again with enough water to obtain mortar of a consistency suitable for grouting.

Partie 3 EXECUTION

3.1 IMPLEMENTATION

- .1 Unless otherwise specified, install mortar and masonry grout in accordance with CSA A179..

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 Canadian Standards Association(CSA)/CSA International.
 - .1 CAN/CSA A23. 1/A23. 2 F00, Concrete: Components and Performance of Concrete Work/Tests.
 - .2 CSA A370 F94(C1999), Masonry Connectors.
 - .3 CSA A371 F94(C1999), Building Masonry.
 - .4 CSA G30. 14 FM1983 (C1998), Crenellated Steel Wire for Concrete Reinforcement.
 - .5 CAN/CSA G30. 18 FM92, Billet Steel Bars for Concrete Reinforcement.
 - .6 CSA S304. 1-94(R2001), Masonry Design for Buildings (Limit State Design).
 - .7 CSA A179 F94, Mortar and Grout for Heavy Masonry.

1.2 DOCUMENTS/SAMPLES TO BE SUBMITTED

- .1 Technical data sheets
 - .1 Submit the required data sheets as well as the manufacturer's product specifications and documentation in accordance with section 01 33 00 Documents and samples to be submitted.
- .2 Workshop drawings
 - .1 Submit the required shop drawings in accordance with section 01 33 00 Documents and samples to be submitted.
 - .2 Installation drawings shall indicate the number of reinforcement elements, connectors and anchors required and the dimensions, spacing and location of these parts.
 - .3 Shop drawings shall include a list of required reinforcing bars and bending details and installation drawings.

1.3 QUALITY ASSURANCE

- .1 Test reports: submit test reports certifying that products, materials and equipment meet the physical characteristics and performance criteria requirements.
- .2 Certificates: submit documents signed by the manufacturer, certifying that the products, materials and equipment meet the physical characteristics and performance criteria requirements.
- .3 The specifications of the fasteners and anchors, as well as those of their installation, must be sealed and signed by an OIQ member structural engineer.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort and recycle waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Partie 2 PRODUCTS

2.1 MATERIALS

- .1 Reinforcing wires: mesh, in accordance with CSA A371 and CSAG30. 14 standards.
- .2 Connectors and anchors: in accordance with CSA A370 and CSAS304 standards.
- .3 Reinforcing bars: grade 400, conforming to CSA-A371 and CAN/CSAG30. 18 standards.
- .4 Corrosion protection: according to CSA S304 and CSA A370 standards.
- .5 Individual bipartite fasteners: stainless steel double rod fasteners, in accordance with ASTM A153 and ASTM A167 standards, allowing proper height adjustment and fixing in an existing concrete block wall, minimum diameter of steel bars: 4.8mm, minimum plate size: 14 gauge. The fasteners must adapt to the width of the cavity and thickness of the insulation.
- .6 Expandable shell bolt: for fixing the fastener to the concrete wall, made of stainless steel or marine brass, diameter 11 mm, 40 mm long, all according to structural engineering calculations to take up tensile forces; minimum pull-out force 675 kg for a 40mm depth in concrete blocks or poured concrete in place.
- .7 Mechanical fasteners for consolidating existing facing walls: 304 stainless steel rod, 6mm diameter and equipped at the ends with 2 marine brass expandable shell bolts with a minimum diameter of 11mm. The anchor must adjust to the width of the cavity and be anchored in a concrete block wall.
- .8 Reinforcing anchorage-type consolidation fasteners: fasteners consisting of a 9 mm diameter stainless steel threaded rod and a mosquito net wire tube with epoxy cone; fastener not to be used below freezing point.
- .9 Fasteners: Standard corrugated fixing brackets (strap) in 304 stainless steel, 1mm thick and 25mm wide.
- .10 Strap fixing screws: stainless steel concrete screws with epoxy.

2.2 SHAPING

- .1 Connectors and anchors shall be shaped in accordance with CSA A370.
- .2 Before shipping, connectors and anchors shall be clearly marked as shown in the drawings.

2.3 ON-SITE QUALITY CONTROL

- .1 Upon request, inform the customer representative of the proposed source of supply for the materials to be supplied.

Partie 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance : Comply with the manufacturer's written requirements, recommendations and specifications, including technical bulletins and installation instructions specified in product catalogues and on packaging cartons, as well as indications in the technical data sheets.

3.2 GENERAL INFORMATION

- .1 Unless otherwise specified, provide and install reinforcements, connectors and anchors in accordance with the requirements of CSA A370, CSA A371, CAN/CSA A23.1 and CSA S304. 1.
- .2 Obtain location, connectors and anchors from the ministeriel representative before placing the mortar.

3.3 FIXING AND BONDING

- .1 Connect the walls of walls consisting of two or more walls using hot-dip galvanized steel connectors and anchors, in accordance with CSA S304 and CSA A371, and as indicated.
- .2 Attach masonry veneers to the substrate in accordance with the National Building Code (NBC), CSAS304. 1 and CSA A371, and in accordance with structural engineering requirements.

3.4 REINFORCEMENT OF LINTELS AND MASONRY BEAMS

- .1 When required, reinforce lintels and masonry beams as per structural engineering requirements.
- .2 Install reinforcement and grout in accordance with CSA S304. 1, CSAA371 and CSA A179 requirements.

3.5 GROUTING INJECTION

- .1 Grout into masonry in accordance with CSA S304. 1, CSA A371 and CSAA179 and section 04 03 09 - grouting.

3.6 INSTALLATION OF ANCHORS

- .1 Provide and install metal anchors as per structural engineering requirements.

3.7 INSTALLATION OF ANCHORS AND LATERAL SUPPORTS

- .1 Provide and install anchors and side supports in accordance with CSA S304.1 and structural engineering requirements.

3.8 ON-SITE BENDING

- .1 Connectors and anchors shall not be bent or bent on site unless specifically indicated or specifically authorized by the structural engineer.
- .2 When on-site bending is permitted, proceed without heat input, slowly applying uniform pressure.
- .3 Replace cracked or cracked connectors and anchors.

3.9 EXECUTION OF ON-SITE ALTERATIONS

- .1 Touch up cut or damaged ends of galvanized or epoxy coated reinforcement, connectors and anchors with a compatible rustproof finish to ensure continuity of their protective coating.

3.10 CLEANING

- .1 Once installation work is complete, remove excess materials, waste materials, tools and safety barriers from the site.

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM D2240 02b, Standard Test Method for Rubber Property Durometer Hardness.
- .2 Canadian International Standards Association (CSA)/CSA
 - . 1 CAN3 A371 94(C1999), Building Masonry.

1.2 DOCUMENTS/SAMPLES TO BE SUBMITTED

- .1 Technical data sheets
 - .1 Submit the required data sheets as well as the manufacturer's product specifications and documentation in accordance with section 01 33 00 Documents and samples to be submitted.
 - .2 Submit installation instructions provided by the manufacturer.

1.3 QUALITY ASSURANCE

- .1 Test reports: submit test reports certifying that products, materials and equipment meet the physical characteristics and performance criteria requirements.
- .2 Certificates: submit documents signed by the manufacturer, certifying that the products, materials and equipment meet the physical characteristics and performance criteria requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort and recycle waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Partie 2 PRODUCTS

2.1 MATERIALS

- .1 Seal base for splitting joints: elastomer of special manufacture, hardness measured by durometer in accordance with ASTM D2240, of prescribed dimensions and shapes.
- .2 Overlap Joint Adhesive: As recommended by the masonry flashing manufacturer.

- .3 Exhaust nozzles: specially manufactured PVC tubes, equipped with polypropylene fibre filters and baffles to ventilate the cavity but prevent water from entering; colour matching the stone facing
- .4 Reinforced polyethylene flashing
 - .1 Creped and bitumen kraft paper, bonded on each side to two 0.75mm thick polyethylene films and reinforced with a 12.7mm x 12.7mm x 12.7mm glass fibre canvas.
- .5 Concealed flashing made of 20 gauge galvanized steel sheet, Z 275 (G90) according to ASTM A-525
- .6 Nailing rods: at least 0.5 mm thick, galvanized metal.
- .7 Bolts: 12mm diameter x 150mm length, with end bent at 90 degrees over a length of 50mm.

Partie 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Comply with the manufacturer's written requirements, recommendations and specifications, including technical bulletins and installation instructions specified in the product catalogues and on packaging cartons, as well as the indications in the technical data sheets.

3.2 PREPARATION OF JOINTS

- .1 Where shown on the drawings, install continuous joint bottoms in the splitting joints.
- .2 In vertical joints in the exterior wall of cavity walls and masonry lined walls, immediately above flashings, install exhaust nozzles at a maximum distance of 600 mm in the horizontal plane.

3.3 IMPLEMENTATION OF ACCESSORIES

- .1 Integrate flashings into masonry in accordance with CSA A371.
- .2 In the case of exterior masonry, install flashings under the first foundation resting on the foundation walls or slab on the ground, on support angles and on steel angles above the bays. Also install flashings under the seats with exhaust nozzles and at other indicated locations.
- .3 In cavity walls and masonry sheathing walls, install flashings under the exterior wall from the exterior to the interior, bend them and raise them against the lining wall to a maximum height of 150 mm; also comply with the following requirements.

- .1 In the case of a masonry liner wall, embed the flashings to a depth of 25 mm in the joints.
- .2 In the case of a concrete liner wall, insert the flashings into engravings.
- .3 In the case of gypsum board liner walls, glue the flashing to the wall using an adhesive recommended by the manufacturer.
- .4 Overlap joints 150 mm wide and seal with adhesive.

3.4 CLEANING

- .1 Once installation work is complete, remove excess materials, waste materials, tools and safety barriers from the site.

END OF SECTION

Partie 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)/CSA International
 - .1 CAN3 A165 F94 SERIES (C2000), CSA Standards for Concrete Masonry Units contains: A165. 1, A165. 2, A165. 3
 - .2 CSA A179 F94 (C1999), Mortar and Grout for Heavy Masonry.
 - .3 CSA A370 F94 (C1999), Masonry Connectors.
 - .4 CSA A371 F94 (C1999), Building Masonry.
 - .5 CSA G30. 14 FM1983(C1998), Crenellated Steel Wire for Concrete Reinforcement.
 - .6 CAN/CSA G30. 18 FM92, Billet Steel Bars for Concrete Reinforcement.
 - .7 CSA S304. 1-94 (R2001), Masonry Design for Buildings (Limit State Design).

1.2 DOCUMENTS/SAMPLES TO BE SUBMITTED

- .1 Technical data sheets
 - .1 Submit Material Safety Data Sheets(MSDSs) required under the Workplace Hazardous Materials Information System (WHMIS), which must comply with WHMIS, as per section 01 33 00 Documents and Samples to be Submitted.
 - .1 The sheets shall indicate the VOC emission rate of epoxy coatings, zinc plating and retouching products.
 - .2 The sheets shall indicate the VOC emission rate of mortars, grouts and coloring agents.

Partie 2 PRODUCTS

- .1 See sections in Divisions 4 and 7.

Partie 3 EXECUTION

3.1 GENERAL INFORMATIONS

- .1 Unless otherwise specified, masonry work shall be performed in accordance with CSA-A371.
 - .1 Device: Such as the existing device to be retained.
 - .2 Seat height: As for details, see plans.
- .2 Perform plumb, level and alignment masonry work, making well aligned vertical joints.

- .3 Arrange the rows of bricks according to the prescribed apparatus and in such a way as to obtain seats of appropriate height and to maintain the continuity of the apparatus above and below the bays, cutting a minimum number of masonry units.

3.2 IMPLEMENTATION

- .1 Exposed masonry structures
 - .1 Remove chipped, cracked or otherwise damaged components from exposed structures and replace them with components in good condition.
 - .2 Cut masonry units where switches, electrical outlets or other recessed or recessed elements are required.
- .2 Flush mounting
 - .1 Install connectors and fittings where on the drawings.
 - .2 Embedding elements to be incorporated into masonry structures.
 - .3 Prevent the recessed elements from moving during construction work. As the work progresses, check the plumbing, alignment and position of these elements frequently.
 - .4 Bracing the door jambs so that they remain plumb. Fill the spaces between the studs and the masonry with mortar.
 - .5 Install loose lintels over the bays where indicated.
- .3 Headers made of concrete masonry units
 - .1 Where no steel or reinforced concrete lintel is required, install a reinforced concrete lintel above the openings in the masonry structure.
 - .2 Support at the ends of the lintels: at least 200mm as shown in the drawings.
- .4 Load support
 - .1 Where grout filled honey comb elements are required instead of solid elements, use grout conforming to CSAA179.
 - .2 Place construction paper under the voids to be filled with grout; place the construction paper 25 mm away from the face of the elements.
- .5 Movement of masonry units
 - .1 Leave a 3 mm gap under the support angles.
 - .2 Leave a 6 mm gap between framing members and top of partitions and non-load bearing walls; do not insert shims.
 - .3 Construct masonry structures to incorporate stabilizers and provide for vertical movement of masonry prior to installation.
- .6 Connection to other structures
 - .1 Cut openings in existing structures as indicated.
 - .2 Any openings in the walls must be approved by the client's representative.

- .3 Rehabilitate existing structures using materials corresponding to those used for their construction.
- .7 Integrate flashings into masonry in with CSA-A371.
 - .1 In the case of exterior masonry, install flashings under the first foundation resting on the foundation walls or slab on the ground, on support angles and on steel angles above the bays. Also install flashings under the seats with exhaust nozzles and at other indicated locations.
 - .2 In cavity walls and masonry veneer walls, install flashings under the exterior wall from the exterior to the interior, bend them and raise them against the lining wall to a maximum height of 150 mm; also meet the following requirements.
 - .1 In the case of a masonry liner wall, embed the flashings to a depth of 25 mm in the joints
 - .2 In the case of a concrete liner wall, insert the flashings into engravings.
 - .3 In the case of a wood-framed liner wall, staple the flashings to the wall under the sheathing paper.
 - .4 In the case of gypsum board linerwalls, glue the flashing to the wall using an adhesive recommended by the manufacturer.
 - .5 Overlap the joints 150 mm wide and seal with adhesive.
- .8 In vertical joints in the exterior wall of cavity walls and masonry veneer walls, immediately above the flashings, install exhaust nozzles at a maximum distance of 600 mm in the horizontal plane.
- .9 Unless otherwise specified, install masonry reinforcement, connectors and anchors in accordance with CSA-A370, CSA-A371, and CSA-S304. 1.
- .10 Obtain approval from the customer representative for the location of reinforcement, connectors and anchors before proceeding with the concrete and mortar installation.

3.3 FIXING AND BONDING

- .1 Connect the walls of walls consisting of two or more walls with stainless steel connectors and anchors, in accordance with CSA-S304 and CSA-A371, and as indicated.
- .2 Fasten masonry veneers to the substrate in accordance with the National Building Code (NBC), CSA-S304. 1 and CSA-A371, and as indicated.

3.4 ARMING OF LINTELS AND CONNECTING BEAMS

- .1 When required, arm lintels and connecting beams as instructed by the ministeriel representative.
- .2 Install reinforcement and grout in accordance with CSA-S304. 1, CSA-A371 and CSA-A179.

3.5 GROUTING INJECTION

- .1 Grout into masonry according to CSA-S304. 1, CSA-A371 and CSA-A179 and as indicated.

3.6 INSTALLATION OF ANCHORS AND LATERAL SUPPORTS

- .1 Provide the required metal anchors and install them according to the ministeriel representative's instructions.
- .2 Install in accordance with CSA-S304. 1 and as directed by the ministeriel representative.

3.7 IMPLEMENTATION TOLERANCES

- .1 The tolerances specified in the notes to Clause 5. 3 of CSA-A371 apply.

3.8 ON-SITE QUALITY CONTROL

- .1 Inspection and testing will be performed by the test laboratory designated by the client's representative.

3.9 CLEANING

- .1 Once the work is completed, clean up the site to remove dirt and debris accumulated during construction and the environment.
- .2 Once work is completed, remove excess materials, waste materials, tools and safety barriers from the site.

3.10 PROTECTION DES OUVRAGES

- .1 Protect masonry structures from marks, mortar burrs and other damage. Use protective tarpaulins that do not stain.

END OF SECTION

Part 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI/CTI A108. 1 99, Specification for the Installation of Ceramic Tile (Includes ANSI/CTI A108. 1A C, 108. 4.13, A118. 1. 10, A136. 1).
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM C144 99, Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207 91(1997), Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C615 99, Specification for Granite Dimension Stone.
 - .4 ASTM C97, ASTM C99 and ASTM C170, most recent editions
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 25. 20 95, Floor Primer.
- .4 Canadian Terrazzo, Tile and Marble Association (TTMAC)
 - .1 Section 09300 of the TTMAC 2000 Master Specification, Tile Installation Manual.
 - .2 Interview Guide 2000.

1.2 SHOP DRAWINGS

- .1 Submit the required shop drawings in accordance with section 01 33 00 Documents and samples to be submitted.
- .2 Shop drawings shall indicate the dimensions and cross-section of the marble parts, the arrangement of the joints, the details of the equipment, as well as details of the anchors, fasteners, studs and catchers and their installation method.
- .3 Each piece of granite shown on the shop drawings shall be marked with a number on its back face or bed face.

1.3 DOCUMENTS/ELEMENTS TO BE SUBMITTED UPON COMPLETION OF THE WORK

- .1 Provide the required maintenance sheets and attach them to the manual referred to in section 01 78 00 Documents/Elements to be submitted upon completion of the work.

1.4 CONDITIONS OF IMPLEMENTATION

- .1 Do not install granite slabs when the temperature is below 12 °C or above 38 °C.
- .2 Maintain a temperature of at least 12°C until the hydraulic binders (cementitious materials) have completely hardened.

- .3 Avoid using epoxy mortars or grouts at temperatures below 15°C or above 25°C.

1.5 TRANSPORT, HANDLING AND STORAGE

- .1 Store materials in a dry place and protect them from freezing, soiling and other damage.
- .2 Store materials on a dry surface.

1.6 ALTERNATIVE MATERIALS/EQUIPMENT

- .1 Provide alternative materials as required in accordance with section 01 78 00 Documents/elements to be provided up on completion of the work.
- .2 Provide the number of rooms of each type and colour corresponding to the higher of 4 m² or 2% of the area to be covered. Mark the packaging as follows:
 - .1 manufacturer's name;
 - .2 product description;
 - .3 color and pattern.
- .3 Keep marble parts in their original packaging to prevent damage.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort and recycle waste in accordance with the requirements of Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 MATERIAL

- .1 Granite : Geological name: Milford Pink.

It must comply with the following performances:
Mass absorption: 0.27% maximum according to ASTM C97
Weight by volume: 2,624 kg/m³ according to ASTM C97
Uni-axial compression: 201 MPA minimum according to ASTM C170
Breaking modulus: 14 MPA minimum according to ASTM C99
- .2 Anchorings: All materials used to anchor the plates shall be 304 stainless steel, with a minimum thickness of 4mm for the plates used as side anchors and a minimum diameter of 6mm for the studs. The anchors will be embedded in epoxy if required. The anchor specifications must be sealed and signed by an OIQ member structural engineer.
- .3 Shims: The support shims shall be made of PVC or stainless steel under aneoprene 90 durometer Shore A pad of a maximum thickness of 3 mm.
- .4 Caulking: Epoxy polyurethane caulking of the same colour as granite.

- .5 Joint base: Closed-cell polyethylene flange, oversized by 30 to 50%.

2.2 MORTARS AND ADHESIVES

- .1 Portland Cement: Compliant with CSA A5, Type 10 standard.
- .2 Sand: Compliant with ASTM C144, passing through No. 16 screen.
- .3 Hydrated lime: in accordance with ASTM C207
- .4 Latex Additive: Prepared for incorporation into Portland cement mortars and thin-bed binder coatings.
- .5 Water: Drinking and free of chemicals and other contaminants whose presence may affect the composition of mortars or grouts.
- .6 Portland cement adhesive mortar (dry or dry laying mortar): in accordance with ANSI A108. 1.
- .7 Portland cement and latex adhesive mortar: meets ANSI A108. 1 standard.

2.3 GROUT

- .1 Grout preparation: according to manufacturer's instructions.
- .2 Portland Cement and Latex Grout: Compliant with ANSI A108. 1.
- .3 Mortars and Furan Grout : Compliant with ANSI A108. 1

2.4 ACCESSORIES/ACCESSORY PRODUCTS

- .1 Sealing compound: in accordance with section 07 92 00 - Sealing of joints.

2.5 FINISHING

- .1 Exposed facing faces shall be planed to a *flamed* finish.

Part 3 EXECUTION

3.1 PREPARATORY WORK

- .1 Cut the square granite blocks to the shape and dimensions indicated, with bed and joint faces as indicated.
 - .1 Grout and install granite slabs as directed; make joints no more than 6 mm thick.
 - .2 Saw or cut the bed and angle joint faces to a depth of at least 2/3 of the thickness of the part, measured from the facing face; for the last third, the bed may have an orthogonality deviation of at most 40 mm per 300 mm length.

- .2 Make foundation joints with no significant differences in level.
- .3 Saw or coarsely straighten the back of the plates to make it approximately flat. The thickness deviation must not exceed 10 mm for parts less than 75 mm thick and 2 mm for thicker parts.
- .4 Split or slit granite pieces in the quarry to obtain pieces whose flatness does not differ by more than 25 mm per 300 mm length, and whose thickness does not differ by more than 25 mm from the prescribed thickness.
- .5 Remove rust stains and iron particles from bed and back faces that have been sawn.
- .6 Execute moulded parts from life-size details. Shape the apparent sharp edges well aligned and soften them a little to prevent spalling.
- .7 Drill holes in the granite parts to insert anchors, wedges and studs. Drill lifting holes in parts that cannot be moved manually, but never in the exposed facing faces.
- .8 Cut the backs of the granite pieces so that they can be adapted to the structural elements on which they are supported. Leave a space of at least 25 mm between the back of the plates and steel or concrete framing members. The bed face of granite pieces resting on structural members must be shaped to fit the supports.
- .9 Cut engravings where indicated for flashing installation.

3.2 IMPLEMENTATION

- .1 Remove dust and foreign matter from bed, facing and joint faces of marble slabs. Do not use metal brushes.
- .2 Install the plumb plates accurately and then secure them with secure anchors.
- .3 Secure the plates with mortar blocks on the back of the plates, at or near the anchor points and at intervals of not more than 500 mm.
- .4 Attach anchors to supporting walls and marble pieces in holes filled with mortar.
- .5 Perform uniform joints of the specified width. Use flexible, non-staining gaskets to maintain the width of the joints, and place them set back from the facing face at a distance approximately equal to the width of a joint.
- .6 Use plastic discharge nozzles.
- .7 Avoid soiling or damaging granite parts and ensure that their edges are not flanged. If necessary, remove mortar stains and clean the parts.

- .8 With a pressurized air jet, remove dirt and loose mortar from the joints to allow grouting to proceed.
 - .1 Moisten joints for mortar jointing; dry them for sealing with sealant.
 - .2 Apply pointing mortar in two steps. With a suitable tool, give the joints as lightly concave shape.
 - .3 Fill with sealing compound. Perform this work in accordance with section 07 92 00 – Joints Sealants.

3.3 TOLERANCES

- .1 Dimensional deviations of granites labs shall not exceed one quarter of the width prescribed for bed faces and joint faces.
- .2 The flatness deviations of polished, softened and finely sanded surfaces at the edges of bed faces and joint faces shall not exceed one-sixth of the width prescribed for joints, and one-quarter of the width of joints in the case of surfaces with a different type of finish. The flatness must be determined with a 1.2 m long ruler placed on the surface in any direction.

3.4 CLEANING

- .1 When finished, wash granite slabs with powdered soap and clean water, then rub them with a soft bristle brush.

END OF SECTION

DIVISION 05

Part 1 General

1.1 DESCRIPTION

- .1 The specialized Contractor shall provide all the materials, equipment and labour required to perform the detailing, joint design, manufacturing, fitting-up, factory painting, transportation, and installation of the steel framework.
- .2 The specialized Contractor shall also provide all parts to be embedded in concrete as well as the anchor bolts.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specifications sections.

1.3 REFERENCES

- .1 The following standards and publications are mentioned in this section of the specifications. When reference is made to them, they must be consulted:
 - .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92 (C2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16-01 CONSOLIDATION, Limit States Design of Steel Structures as well as CAN/CSA S16S1-05, Supplement no 1.
 - .4 CAN/CSA-S136-01 (C2007), North American Specification for the Design of Cold-Formed Steel Structural Members as well as CAN/CSA-S136S1-04, Supplement.
 - .5 CAN/CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
 - .6 CAN/CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding.

- .7 CAN/CSA W55.3-1965 (R2003), Certification of Companies for Resistance Welding of Steel and Aluminium.
- .8 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A36/A36M-00, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A193/A193M-08b, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications .
 - .3 ASTM A307-04, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A325-02, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .5 ASTM A325M-00, Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric).
 - .6 ASTM A490M-00, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .4 Canadian Institute of Steel Construction (CISC)/Canadian Paint and Coatings Association – CPCA (formerly the Canadian Paint Manufacturers Association - CPMA).
 - .1 CISC/CPMA 1-73A (1975), A Quick-drying One-coat Paint for Use on Structural Steel.
 - .2 CISC/CPMA 2-75, A Quick-drying Primer for Use on Structural Steel.
- .5 Master Painters Institute
 - .1 MPI-INT 5.1-04, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1-04, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC)
 - .1 SSPC-SP 3 (1995), Power Tool Cleaning.

- .7 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2010 and Supplement
- .8 Code de Construction du Québec - Chapter I, Building, and National Building Code - Canada 2015 (amended) as well as the User's Guide - NBC 2015: Comments on the calculation of structures (Part 4 of Division B).

- .2 Unless otherwise specified, perform structural steel work and welding work in compliance with the CAN/CSA-S16-01 and CAN/CSA S136S1-04 Standards.
- .3 The framework welding shall only be performed by a duly approved member of the Canadian Welding Bureau (CWB), in accordance with the requirements of the CAN/CSA W47.1 standard, Division 1 or Division 2.1. Check whether the subcontractor is a certified member of the CWB in the Division concerned, because the Departmental Representative will reject any specialized contractor that does not meet this requirement.

1.4 DESIGN CRITERIA

- .1 Structural and jointing details shall be designed in accordance with the requirements of the CAN/CSA-S16, CAN/CSA-S136 and CAN/CSA S136S1-04 standards, so that they can withstand the indicated forces, moments and shear stresses, and accommodate anticipated thermal movements.
- .2 Factory connections shall be welded.
- .3 Unless otherwise indicated on the drawings, the types of bolted joints are as follows:

Components	Types of Connections
Beams, columns	Bearing type
Bracing	Slip critical connections
Trusses	Slip critical connections

- .4 Unless otherwise indicated on the drawings, the stresses to be used in the design of connections are as follows:

Components	Stresses
Beams, columns	The more stringent of two (2) criteria: <ul style="list-style-type: none">▪ Reaction of the uniform load producing the section's ultimate resisting moment▪ Or 50% of the beam's shear strength
Columns	<ul style="list-style-type: none">▪ The section's ultimate compressive strength and shear strength
Trusses	<ul style="list-style-type: none">▪ The section's ultimate tensile strength

- .5 Additional stresses induced on components to be connected:
- .1 All joints shall be designed so that no additional stresses are induced on the components to be connected.
 - .2 The Departmental Representative shall reject all details that create torque, bending moment or other stresses.
 - .3 The Departmental Representative shall be the only one to decide whether the details submitted are accepted or rejected.
 - .4 All modifications relating to changes required by the Departmental Representative shall be at the specialized Contractor's expense.
- .6 For non-standard joints, submit sketches and design notes bearing the seal and signature of a qualified Engineer recognized in the Province of Quebec, Canada.
- .7 Use at least two bolts per bolted joint (including those where anchors are used).
- .8 The depth of a beam joint shall never be less than 50% of the beam.

1.5 SHOP DRAWINGS

- .1 Submit the shop drawings to the Departmental Representative.
- .2 Each shop drawing must bear the seal and signature of an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec.

- .3 Clearly indicate on the shop drawings all forming and assembly details, including cuts, cut-outs, joints, drill holes, threaded anchors, bolts, shear connectors and welds. Use the symbols indicated in the CAN/CSA W59 Standard to represent welds.
- .4 Submit to the Departmental Representative the description of the work methods, the order in which the components are to be assembled, and the type of material intended for use. Even if this formality has been fulfilled and the document submitted, the specialized Contractor remains solely responsible regarding the use of the methods, equipment, delivery mode and safety measures.
- .5 Provide the Departmental Representative with three (3) copies of each complete and detailed shop and erection drawings of the steel framework to be built. The drawings shall be provided in metric units (SI).
- .6 The shop and erection drawings shall contain all the information mentioned in Articles 4.2 and 4.3 of the CAN/CSA-S16 Standard and bear the signature of the person who verified them before their submission to the Departmental Representative.
- .7 The project title as well as the names of the Owner, Architect, Departmental Representative, Expert framework consultant and of the Contractor shall appear on each shop and erection drawing.
- .8 The shop and erection drawings shall be sent soon enough to ensure that the Departmental Representative has at least ten (10) working days to examine them.
- .9 A copy of each drawing shall be returned to the specialized Contractor who, if required, shall revise the annotated drawing(s) and resubmit it (them). If the Departmental Representative determines that the revisions are too numerous or complex, he shall return the drawing(s) without annotating it (them). The Contractor shall be responsible for making any additional copies he requires.
- .10 The specialized Contractor shall only manufacture the framework components after the Departmental Representative has returned the shop and erection drawings.

1.6 ASSEMBLY VIDEO

- .1 The steel framework Contractor, in conjunction with the manufacturer of the pre-stressed concrete components, shall make an assembly video that shows in details the components installation sequences.
- .2 The sequences shall be ordered as to balance the various loads exerted on the main trusses to avoid any twisting.

1.7 VERIFICATION OF DIMENSIONS, MEASUREMENTS AND LEVELS

- .1 Before manufacturing the components of the framework, take and check all the dimensions, measurements and levels on site to compare them with the ones on the drawings or to complete the information shown on the drawings.
- .2 Notify the Departmental Representative of any errors on the construction site or of any incompatibility between the dimensions taken and the instructions provided on the drawings. Await the Departmental Representative's instructions on how to correct the errors and/or make the required adjustments.
- .3 If connecting to an existing framework, check all the dimensions, measurements and levels of the existing framework before producing shop drawings of the new frame that will be connected to it. Adjust the dimensions of the parts to be built to the situation and submit the modifications to the Departmental Representative.

1.8 QUALITY ASSURANCE

- .1 Submit 3 copies of shop trial reports 4 weeks prior to assembly of the structural steel work.
 - .1 The shop trial reports shall indicate the steel's chemical and physical properties, as well as other relevant details before it is used for this work,
 - .2 The trial reports shall be certified by qualified metallurgists authorized to work in the Province of Quebec, Canada.
- .2 Also provide an affidavit from the manufacturer of the structural steel work certifying that the products, equipment and materials used for this work comply with the relevant standards that apply to the required or indicated products, equipments and materials.

Part 2 Products

2.1 MATERIALS

- .1 Use materials free of dirt, rust, scale, pinholes, leafing or any other defect. No used materials shall be accepted.
- .2 General structural steel: in compliance with the CAN/CSA-G40.20/G40.21 Standard of grade 350W
- .3 Hollow Structural Sections (HSS): in compliance with the CAN/CSA-G40.21 and CAN/CSA-S16 Standards, of grade 350W, class H, as indicated on the drawings.

- .4 High-strength bolts, nuts and washers: in compliance with the ASTM A325M or A490M Standard.
- .5 Anchor bolts:
 - .1 Lower strength: in compliance with the CAN/CSA G40.21 Standard, grade 300W and the ASTM A307 Standard, grade A.
 - .2 High-strength: in compliance with the ASTM-A-449 standard with a minimum yield strength of 500 MPa.
- .6 Welding materials: in compliance with the CAN/CSA W59 Standard and the CAN/CSA W48 series Standards and approved by the Canadian Welding Bureau.
- .7 Shear connectors (if required on the drawings): in compliance with the CAN/CSA W59 Standard, Clause 5.5.6 and its Appendix H.
- .8 Non-shrink grout: non-metallic pre-mixed Portland cement-based product, of a consistence appropriate for pouring and capable of achieving at least 50 MPa compression strength at 28 days, subject to the Departmental Representative's approval.
- .9 Paint:
 - .1 1-73A CISC/CPMA: "Quick-drying one-coat paint for use on structural steel", grey colour.
 - .2 2-75 CISC/CPMA: "Quick-drying primer for use on structural steel", grey colour.
- .10 Mechanical anchor bolts (when specified on the drawings) approved by the Departmental Representative. The type required, the diameter and total length are specified on the drawings.
- .11 Hot dip galvanizing: apply a minimum 600 g/m² coat of zinc on the indicated areas, in compliance with the CAN/CSA-G164 Standard.
- .12 Touch up paint for galvanized steel: Complies with CAN / CGSB-1.181 with a metal zinc content higher than 87% (% in mass of the non-volatile part) such as the "ZRC Cold Galvanizing Compound" of ZRC Worldwide. Aerosol coatings are not permitted and the dry coating film must contain 95% zinc metal.

2.2 FACTORY PAINTING

- .1 Structural steel components shall be cleaned, prepared and coated with a layer of primer at the workshop in compliance with the CAN/CSA-S16 Standard, with the exception of components to be embedded in concrete.

- .2 The components shall be cleaned and freed of millscale, rust, oil, dust and all other foreign material. The surfaces shall be prepared according to the SSPC-SP 3 method.
- .3 A layer of primer shall be applied at the workshop so as to produce a dry film of at least 4 mils thick, on all steel surfaces, with the exception of the following surfaces:
 - .1 surfaces embedded in concrete;
 - .2 surfaces to which shear dowels will be fastened at the construction site;
 - .3 surfaces and edges that are to be welded on site;
 - .4 friction joint contact surfaces;
 - .5 surfaces located below grade and in direct contact with the ground.
- .4 In cases where frame components are not visible in the finished building (structural steel components covered by other construction materials), at the shop, apply on the structural steel a quick-drying one-coat paint for use on structural steel, in compliance with the 1-73A CISC/CPMA Standard. Follow the requirements of this standard regarding the methods to be used, atmospheric conditions to maintain and temperatures to respect when applying the paint.
- .5 In cases where frame components are visible in the finished building (exposed structural steel components later covered with one or two coats of finish paint on site, such as a gymnasium), at the shop, apply on the structural steel a quick-drying primer for use on structural steel, which complies with the 2-75 CISC/CPMA Standard. Follow the requirements of this standard regarding the methods to be used, atmospheric conditions to maintain and temperatures to respect when applying the paint.
- .6 Paint on nuts, bolts, straight edges and angles shall be removed before it is dry.

Part 3 Performance

3.1 FORMING

- .1 Form the steel components in compliance with the CAN/CSA-S16 Standard and according to the shop drawings submitted.
- .2 Structural members formed of welded sections shall be rejected if they are not shown as such on the shop drawings.
- .3 The use of members whose quality and/or dimensions differ from those shown is strictly forbidden without the Departmental Representative's written permission.
- .4 Drill or punch the bolt holes. All burning or cutting with a torch is forbidden.

- .5 The manufacturing and assembly tolerances are respectively those described in Sections 28.9 and 30.7 of the CAN/CSA-S16 Standard.
- .6 If required, reinforce the openings to maintain the design strength.
- .7 Where indicated on the drawings, continuously seal all steel members with a continuous weld bead and grind the welds.
- .8 Reinforce the girder web with stiffening plates at each girder-column intersection and at each concentrated load location.
- .9 Grind visible welds where required.
- .10 Provide the qualified trades persons with the templates and the parts to be embedded in the concrete or masonry.
- .11 Once the assembly is completed, touch-up the rivets, on-site welds, and bolts as well as burned or scratched surfaces.
- .12 Apply a zinc primer on galvanized surfaces in areas burned as a result of on-site welding work.
- .13 The welding companies shall be certified under the terms of Division 1 of these specifications or Article 2.1 of the CAN/CSA W47.1 Standard regarding fusion welding of steel structures, and/or the CAN/CSA W55.3 Standard regarding resistance welding of structural members.

3.2 MARKING

- .1 Mark the materials in compliance with the CAN/CSA-G40.21 Standard. Do not use die-stamping. When the steel part must not be painted, stamp the mark in locations that will not be visible after assembly.
- .2 Joint markings: at the factory, mark load-bearing assemblies, assembly joints and adjustment joints.

3.3 ASSEMBLY

- .1 The proposed technique, as well as the equipment used to erect the frame are subject to the Departmental Representative's approval. However, this approval shall in no way release the specialized Contractor from his full responsibility regarding the choice of technique and the handling of the equipment that will enable him to perform his work quickly and in complete safety.
- .2 Assemble the steel components in compliance with the CAN/CSA-S16 Standard and according to the shop drawings.

- .3 Assemble the metal structures ensuring that they are square, plumb, aligned, accurately adjusted, and have tight joints and intersections.
- .4 Where indicated on the drawings, continuously seal all steel members with a continuous weld bead and grind the welds.
- .5 Obtain the Departmental Representative's written authorization before cutting or modifying structural steel members on site.
- .6 Once the assembly is completed, touch up the bolts, rivets, welds, and surfaces where the factory-applied galvanization is degraded.
- .7 Deliver, handle and store all steel on site to avoid any damage. Damaged members and joints shall be rejected.
- .8 Take measures so as not to overload on-site structures which are already completed or under construction, beyond the allowable loads indicated on the drawings for these structures.
- .9 Where required on the drawings, weld shear connectors to the load-bearing components of the frame, using steel decking if required, following the manufacturer's instructions.
- .10 Notify the Departmental Representative as soon as possible regarding any defects detected in the assembly of factory-built components and abide by his decision regarding the corrections to be made.
- .11 Straighten slightly deformed components before assembling them on site and replace those that are damaged to the point where the Departmental Representative raises doubts regarding their effectiveness.
- .12 It is strictly forbidden to perform joint welds on site unless they are indicated on the shop drawings or the Departmental Representative has approved them beforehand.
- .13 It is strictly forbidden to drill, cut or modify in any way a component of the frame on site without having obtained the Departmental Representative's written authorization beforehand.
- .14 Galvanized steel framing should not be cut, drilled, or modified in any way on site. If structural modifications are made to the galvanized steel structural framing, they must be returned to the workshop to be re-galvanized.

3.4 ON-SITE QUALITY CONTROL

- .1 The Departmental Representative shall have access to the shop at all times to inspect the manufacturing and assembly work performed there.

- .2 The Departmental Representative may require that analytical trials, estimates and calculations be performed. Replace all work or materials found to be defective, at no expense and without any unnecessary project delays.
- .3 At the Departmental Representative's request, provide a factory certificate attesting that the quality of the steel meets the requirements of the contract documents.
- .4 At the Departmental Representative's request, provide him with certified copies of the steel factory inspection reports concerning the chemical and physical properties of the steels used.
- .5 A testing laboratory approved by the Departmental Representative shall inspect and test materials and craftsmanship.
- .6 The Departmental Representative may require that the Laboratory assess certain welds he considers important through visual inspection, or by performing penetrating liquid, magnetic particle, x-ray or ultrasound examinations. Cooperate fully on the performance of these tests and if required make the necessary repairs following these inspections.
- .7 The parts of welds that have been repaired shall be fully re-inspected following the same method used to perform the first inspection.
- .8 The Laboratory shall check the shear connectors using the following method: after welding, the specialized Contractor shall remove the ceramic ring around each connector and the Laboratory shall visually inspect the weld bead. Beads extending less than 360 degrees shall undergo more thorough inspection. These types of connectors shall be tested using a hammer to bend the connector 15 degrees from vertical toward the nearest side of the embedded plate or structural component. Welds that bend without breaking are acceptable. Bent connectors shall not break when straightened after the test. In addition, the Laboratory shall use the same method to conduct random testing on one percent of connectors where the weld bead is visually acceptable. The specialized Contractor shall replace defective connectors at his expense.
- .9 The Departmental Representative may ask the specialized Contractor to check whether the columns are plumb, in his presence. The Contractor shall provide the equipment required to perform this audit.
- .10 The Departmental Representative may ask the specialized Contractor to check the bolted joints, in his presence. High-strength joint shall comply with the CAN/CSA-S16 Standard, clauses 23.7 and/or 23.8.
- .11 The inspection and verification to ensure the framework is aligned, plumb and level shall comply with the CAN/CSA-S16 Standard, clause 29.7.

3.5 JOINTS

- .1 Unless otherwise indicated on the drawings, all factory-built joints shall be welded. If friction joints are specified, high-strength bolts shall be used.

- .2 High-strength bolts shall be used on all friction joints performed on site, in accordance with Section 23 of the CSA-S16-01 standard.

3.6 TEMPORARY BRACING

- .1 Assembly the steel framework, ensuring it is aligned and plumb to specified tolerances. Use temporary bracing for the assembly where necessary to offset any load to which the frame may be subjected, including wind, snow, equipment, and its use.

Leave these braces in place without disturbing them as long as they are required for safety, and until final installation of permanent braces.

- .2 The specialized Contractor shall be responsible for any negligence in adequately anticipating the stresses exerted during assembly of the framework.
- .3 Do not perform permanent bolting, welding or riveting as long as the braced framework has not been properly aligned.
- .4 The specialized Contractor is entirely responsible for the temporary stability of the steel frame.

3.7 GROUT APPLICATION

- .1 Where indicated on the drawings, after the framework has been erected and aligned, completely fill the space under column base plates or other supports with the specified non-shrink grout, following the manufacturer's written instructions.
- .2 Install the grout and wait until it has achieved 75% of its specified strength before pouring the concrete slabs on steel decking.

3.8 ON-SITE PAINTING

- .1 Unless otherwise indicated, all damaged surfaces and unpainted surfaces in the workshop must be retouched with a paint conforming to ICCA / PSAC 1-73A or ICCA / PSAC 2-75, depending on the case. Prepare surfaces to be retouched in accordance with SSPC SP-3. Retouch for galvanized steel.
- .2 Following approval by the Departmental Representative, galvanized steel framing with surfaces that have been damaged or scuffed during transport, handling or assembly shall be retouched with a zinc-rich paint on the surfaces in question.
- .3 Galvanized steel framing with a damaged surface or cumulative scratches for an element greater than 10 cm² shall be disassembled, returned to the workshop to be re-galvanized and re-installed.

3.9 SUBSTITUTION

- .1 Do not change the dimension and size of the members shown on the drawings without the Departmental Representative's written authorization. Substitution of members with units stronger than those specified may be accepted at no additional cost.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 33 00 - Site Furnishings

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269M-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM F1554-18 Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strenght
- .2 CSA Group
 - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16-14, Design of Steel Structures.
 - .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (developed with the Canadian Welding Bureau).
 - .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Metric).
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-2011, Paints and Coatings.
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
- .5 ULC Standards
 - .1 UL 2768-2011, Architectural Surface Coatings.
 - .2 UL 2760-2011, Surface Coatings - Recycled Water-borne.

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 bolts, proposed sections, tubing, plates and pipes. Include product characteristics, performance criteria, physical size, finish and limitations.

- .2 Submit one copy of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and Section 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 Quebec, Canada.
 - .2 Shop drawings to indicate or show materials, web thickness, finish, assemblies, joints, anchoring method and number of anchors, supports, reinforcements, details and accessories.

1.4 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.

1.5 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 off ground 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 of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.
- .2 Steel pipes: to ASTM A53/A53M, galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.

2.2 METAL FABRICATIONS - GENERAL

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Unless otherwise indicated, use self-tapping shake-proof round-headed screws on items requiring assembly by screws.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Exposed welds 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/m2to CAN/CSA-G164.
- .2 Exterior baked polyester powder coating, to the following performance standards:
 - .1 Salt spray: ASTM D-2247
 - .2 Humidity: ASTM B117
 - .3 Flexibility: ASTM D3359
 - .4 Adherence: ASTM D3359
- .3

2.4 INSULATION COATING

- .1 Not used.

2.5 SHOP PAINTING

- .1 Clean surfaces of excess zinc by fine sand blasting and hand finishing with fine-grain orbital air sanders.
- .2 Use chloric acid to clean/degrease parts.
- .3 Rinse then dry with a jet of compressed hot air.
- .4 If necessary, use Tiger EPO-Strong (93/70080) high-temperature filler to conceal imperfections.
 - .1 Using an electrostatic process, apply ES-0701-G zinc-rich epoxy primer and RAL white finish paint. Use UV-resistant polyester resin powder for exteriors. Resin is stabilized by controlled temperature heating. Final thickness is 7 to 8 mils.

2.6 ANGLE LINTELS

- .1 Not used.

2.7 PIPE RAILINGS

- .1 Not used.

2.8 CORNER GUARDS

- .1 Not used.

2.9 ACCESS LADDERS

- .1 Not used.

2.10 TRENCH COVERS AND FRAMES

- .1 Not used.

2.11 CHANNEL FRAMES

- .1 Not used.

2.12 DUCTILE IRON TREE GRATES

- .1 Grade 65-45-12 ductile iron grate, sized as indicated in construction details.
- .2 Unpainted finish.

2.13 TREE GRATE FRAMES

- .1 Galvanized steel tree grate frames. Weld sections together to form continuous frame, sized as indicated in plans.
- .2 Galvanize frames after fabrication.

Part 3 Execution

3.1 EXAMINATION

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

3.2 ERECTION - GENERAL

- .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 the 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 necessary components for the work by other trades in accordance with schedule and shop drawing submittals.

- .6 Make field connections with bolts to CSA S16.
- .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, bolts and burnt or scratched surfaces with primer.
 - .1 Primer: maximum VOC limit 250 g/L to GS-11.

3.3 PIPE RAILINGS

- .1 Not used.

3.4 CORNER GUARDS

- .1 Not used.

3.5 ACCESS LADDERS

- .1 Not used.

3.6 TRENCH COVERS

- .1 Not Used.

3.7 CHANNEL FRAMES

- .1 Not Used.

3.8 DUCTILE IRON TREE GRATES

- .1 Install buoys where indicated.

3.9 TREE GRATE FRAMES

- .1 Install planters where indicated.

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.

3.11 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials and equipment by installation of the metal structures.

END OF SECTION

DIVISION 07

Part 1 GENERAL INFORMATION

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C919 02, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB19 GP 5M 1984, One-component, acrylic-based, solvent-evaporative polymerization, one-component sealant (April 1976 edition confirmed, incorporating modifier number 1).
 - .2 CAN/CGSB 19. 13 M87, One-component, elastomeric, chemically cured, one-component sealant.
 - .3 CGSB19 GP 14M 76, One-component, one-component, poly isobutylene butyl-based, solvent evaporation polymerization sealant (April 1976 confirmation).
 - .4 CAN/CGSB 19. 17 M90, One-component sealant based on an acrylics in emulsion.
 - .5 CAN/CGSB 19. 24 M90, Multi-component, chemically cured sealant.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999.
- .4 General Services Administration (GSA) Federal Specifications (FS)
 - .1 FS SS S 200 E(2)1993, Sealants, Joint, Two Component, Jet Blast Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDSs).
- .6 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992.

1.2 DOCUMENTS/SAMPLES TO BE SUBMITTED

- .1 Submit the manufacturer's datasheets, samples and instructions in accordance with section 01 33 00 Documents and samples to be submitted.
- .2 The manufacturer's data sheets shall include the following:
 - .3 caulking products;
 - .4 the primaries;
 - .5 sealing compounds (all types), including their compatibility with each other.

- .6 Submit the required samples in accordance with section 01 33 00 Documents and samples to be submitted.
- .7 Submit two samples of each colour and type of product offered.
- .8 If necessary, for harmonization with adjacent materials, submit dried samples of the sealants to be left visible for each proposed colour.
- .9 The manufacturer's instructions shall cover each of the products offered.

1.3 QUALITY ASSURANCE /SAMPLES TO BESUBMITTED

- .1 Perform the required work samples in accordance with section 01 45 00 Quality Control.
- .2 Samples shall show the location, dimensions, profile and depth of the joints, including the joint base, primer and sealant and caulking.
- .3 The samples of the work will be used for the following purposes:
 - .1 evaluate the quality of work execution, substrate preparation, equipment operation and materials implementation.
- .4 Conduct samples of the work at locations designated by the client's representative.
- .5 Wait 24 hours before starting sealing work to allow the customer representative to inspect the samples.
- .6 Once accepted, samples are the minimum standard to be met for the work; they may be incorporated into the finished work or removed, as decided by the client representative.

1.4 TRANSPORT, HANDLING AND STORAGE

- .1 Transport, store and handle equipment and materials in accordance with section 01 61 00 Common Product Requirements.
- .2 Transport and store materials in original containers and packaging with the manufacturer's bucket and label intact. Protect materials from water, moisture and freezing; do not place them directly on the ground or on a floor.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

1.6 CONDITIONS OF IMPLEMENTATION

- .1 Environment
 - .1 Do not apply the sealants under the following conditions:
 - .1 When the ambient temperature and substrate temperature are outside the limits established by the product manufacturer or when they are less than 4.4 degrees Celsius.
 - .2 When the substrate is wet.
- .2 Joint width
 - .1 Do not apply sealants when the joint width is less than that established by the product manufacturer for the specified applications.
- .3 Support
 - .1 Do not apply sealants until the substrate has been cleared of all contaminants that may prevent adhesion of the products.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Meet the requirements of the Work place Hazardous Materials Information System (WHMIS) for the use, handling, storage and disposal of hazardous materials and the labeling and provision of Material Safety Data Sheets recognized by Labour Canada.
- .2 Comply with the manufacturer's recommendations for substrate temperatures, relative humidity and moisture content for the application and drying of sealants, as well as special instructions for their use.

Part 2 PRODUCTS

2.1 SEALING PRODUCTS

- .1 Caulking products that emit strong odours, contain toxic chemicals or are not certified as being of a mould resistant type shall not be used in air handling units.
- .2 If toxic products cannot be used other than, restrict their use to areas where the fumes can be discharged outdoors or confined behind an airtight system, or apply them several months before the area is occupied to allow the fumes to be discharged over the longest possible period.
- .3 In the case of sealants approved with a primer, only the primer in question shall be used with the said sealant.

2.2 SEALING PRODUCTS – DESCRIPTION

- .1 Caulking: 3-component epoxy polyurethane terpolymer, color matching the siding.

- .2 Sealant Primer: compressible strand of circular section of closed cell foam and extruded polyolefin; strand compresses 30% in the seal; strand must be compatible with the seal.
- .3 Mortar joint base: round section section and solid neoprene foam rod; closed cell vinyl 50 with a Shore A hardness of 70 when 40% compressed
- .4 Preformed high-density foam gasket bottoms of extruded cellular polyethylene foam, with a Shore A hardness of 20 and a tensile strength of 140 to 200 kPa, extruded polyolefin foam, with a density of 32 kg/m³, or neoprene, of dimensions recommended by the manufacturer.
- .5 Polyethylene anti-solidification tape not adhering to the sealant.

2.3 SEALING PRODUCTS FOR LOCATIONS

- .1 Perimeter of openings in exterior walls where the frames are adjacent to the finish coating.
- .2 Expansion and splitting joints in the exterior wall of precast concrete or stone masonry walls.

2.4 CLEANING PRODUCTS FOR JOINTS

- .1 Non-corrosive and non-fouling cleaning products, compatible with seal materials and sealants, and recommended by the manufacturer of the latter.
- .2 Primer: according to manufacturer's instructions.

Part 3 EXECUTION

3.1 PROTECTION OF THE WORK

- .1 Protect structures installed by third parties from soiling or any other form of contamination.

3.2 SURFACE PREPARATION

- .1 Check the dimensions of the joints to be made and the condition of the surfaces in order to obtain an adequate width/depth ratio for the use of joint bottoms and sealing products.
- .2 Remove all undesirable materials from the surfaces of the seals, including dust, rust, oil, grease and other foreign matter that may affect the quality of workmanship.

- .3 Do not apply sealants to joint surfaces that have been treated with a filler, curing compound, water repellent or other type of coating unless prior testing has confirmed the compatibility of these materials. Remove coatings already covering surfaces, when required.
- .4 Ensure that the surfaces of the joints are well dried and not frozen.
- .5 Prepare surfaces according to manufacturer's instructions.

3.3 PRIMARY APPLICATION

- .1 Before applying primer and caulking, mask adjacent surfaces as necessary to avoid soiling.
- .2 Apply primer to the lateral surfaces of the joints immediately before applying the sealant, in accordance with the sealant manufacturer's instructions.

3.4 INSTALLATION OF THE JOINT BASE

- .1 Apply anti-stiffness tape where required, in accordance with the manufacturer's instructions.
- .2 Compressing it by approximately 30%, lay the joint base according to the desired depth and joint profile.

3.5 DOSAGE

- .1 Measure the components in strict accordance with the instructions of the sealant manufacturer.

3.6 IMPLEMENTATION

- .1 Application of the sealant
 - .1 Apply the sealant in accordance with the manufacturer's written instructions.
 - .2 To achieve clean joints, apply masking tape to the edges of the surfaces to be grouted, if necessary.
 - .3 Apply the sealant in a continuous bead.
 - .4 Apply the sealant with a gun equipped with an appropriately sized nozzle.
 - .5 The supply pressure shall be sufficiently high to allow voids to be filled and joints to be perfectly sealed.
 - .6 Seals shall be made in such a way as to form a continuous bead of water proofing free of edges, folds, slumps, air voids and embedded dirt.
 - .7 Before a skin forms on the joints, shape the exposed surfaces to give them a slightly concave profile.
 - .8 Remove excess sealant as work progresses and at the end of the work.

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- .2 Drying
 - .1 Ensure the drying and curing of sealants in accordance with the manufacturer's instructions for these products.
 - .2 Do not cover joints made with sealants until they are thoroughly dry.
 - .3 Cleaning
 - .1 Immediately clean adjacent surfaces and leave structures clean and in perfect condition.
 - .2 As the work progresses, remove excess and burrs of sealant with recommended cleaning products.
 - .3 Remove the masking tape at the end of the initial set period of the sealant.

END OF SECTION

DIVISION 26

Part 1 General

1.1 REFERENCES

.1 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.

.2 Reference Standards:

.1 CSA Group:

- .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
- .2 CSA C22.2 No. 10-10, Code de construction du Québec, Chapitre V - Électricité.
- .3 CAN/CSA-C22.3 No.1-10, Overhead Systems.
- .4 CAN/CSA-C22.2 No. 7-15 Underground Systems.
- .5 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC):

- .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 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 Quebec, Canada.
- .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
- .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Submit eight copies to authority having jurisdiction.
- .6 If changes are required, notify Departmental Representative of these changes before they are made.

- .3 Certificates:
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: In accordance with General Conditions of Contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .4 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.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for incorporation into manual.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start-up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: Remove for reuse by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan, in accordance with Section 01 74 21 - 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 and labels for control items, both in English and French.
- .4 Use one nameplate and label for both languages.

2.2 MATERIALS AND EQUIPMENT

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Assembled control panels and component shall be CSA certified or equivalent.

2.3 ELECTRIC MOTORS, EQUIPMENT, AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment, and controls, as indicated.

2.4 WARNING SIGNS

- .1 Warning Signs: In accordance with Departmental Representative's requirements.
- .2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES			
1	10 x 50 mm	1 line	3 mm high letters
2	12 x 70 mm	1 line	5 mm high letters
3	12 x 70 mm	2 lines	3 mm high letters
4	20 x 90 mm	1 line	8 mm high letters
5	20 x 90 mm	2 lines	5 mm high letters
6	25 x 100 mm	1 line	12 mm high letters
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 and labels 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 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. XXX" as directed by Departmental Representative.
- .7 Disconnects, Starters, and Contactors: Indicate equipment being controlled and voltage.
- .8 Terminal Cabinets and Pull Boxes: Indicate system and voltage.
- .9 Transformers: Indicate capacity, primary, and secondary voltages.

2.7 WIRING IDENTIFICATION

- .1 When colour jacket conductors are not available, identify wiring with permanent indelible identifying markings, numbered, and coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour Coding: To CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes, and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor and at 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

2.9 FINISHES

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

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.
- .2 Do overhead systems in accordance with CAN/CSA-C22.3 No. 1, except where specified otherwise.

- .3 Do underground systems in accordance with CAN/CSA-C22.3 No. 7, 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: Schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire-rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits, and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.6 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panel boards 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 panel boards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power distribution system including phasing, voltage, grounding, and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters, and associated control equipment, including sequenced operation of systems, where applicable.

- .5 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.

3.7 SYSTEM START-UP

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

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 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 SUMMARY

- .1 This Section includes requirements for selective demolition and removal of electrical components including removal of conduit and wiring, junction boxes, etc., and incidentals required to complete work described in this Section.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 13 – Selective Site Demolition.

1.3 REFERENCE STANDARDS

- .1 CSA Group (CSA).
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

1.4 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are maintained onsite.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment, if handled improperly, as defined by Federal Hazardous Products Act (RSC 1985), including latest amendments.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
 - .1 Provincial/Territorial Workers' Compensation Boards/Commissions.

1.7 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.
- .2 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform following activities:
 - .1 Refer to Section 01 41 00 – Regulatory Requirements for directives associated with specific material types.
 - .2 Hazardous substances will be as defined in Hazardous Products Act.
 - .3 Stop work in area of suspected hazardous substances.
 - .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .5 Hazardous substances will be removed by Departmental Representative under a separate contract or as a change to Work.
 - .6 Proceed only after written instructions have been received from Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .2 Fire-stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire-rated performance.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials

necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of existing systems to remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that will remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
 - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Coordinate requirements of this Section as follows:
 - .1 Remove existing luminaires, electrical devices and equipment including associated conduits, boxes, wiring, and similar items, unless specified otherwise.
 - .2 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work and leave site clean and ready for subsequent renovation work;
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
 - .3 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
 - .4 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.
 - .5 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre).

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

- .1 CSA International:
 - .1 CAN/CSA-C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No. 65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC):
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA).

1.3 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 wire and box connectors, 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 wire and box connectors for incorporation into manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

- .3 Packaging Waste Management: Remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Waste Management Plan, in accordance with Section 01 74 21 - Waste Management and Disposal.

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, flexible conduit, as required by 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 cables, and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .3 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 reuse recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

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 and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Waste Management and Disposal.

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.

2.2 BUILDING WIRES

- .1 Conductors: Stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper Conductors: Size as indicated, with 1000 V insulation of cross-linked thermosetting polyethylene material rated RWU90 XLPE, Non-Jacketed.

2.3 TECK 90 CABLE

- .1 Cable: In accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: Copper as indicated.
 - .2 Circuit conductors: Copper as indicated, size as indicated.
- .3 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: 1000 V.
- .4 Inner Jacket: Polyvinyl chloride material.
- .5 Armour: Interlocking aluminum.

- .6 Overall Covering: Thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7 Fastenings:
 - .1 One-hole stainless steel straps to secure surface cables 50 mm and smaller. Two-hole stainless steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables at 600 mm centers.
- .8 Connectors:
 - .1 Watertight, approved for TECK cable.

2.4 CONTROL CABLES

- .1 Type: 600 V stranded annealed copper conductors, sizes as indicated:
 - .1 Insulation: Cross-linked polyethylene type, RW90 (x-link).
 - .2 Overall covering: Thermoplastic jacket with sheath of interlocked armour and jacket over sheath of PVC.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

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

3.2 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches in accordance with Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.
- .2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1,000 V).
- .3 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

3.3 INSTALLATION OF TECK90 CABLE (0 -1,000 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 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 CSA Group:
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No. 41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CSA C22.2 No. 65-13, Wire Connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

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 connectors and terminations, 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 connectors and terminations, for incorporation into manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in a clean, dry, and well-ventilated area.
 - .2 Store and protect connectors and terminations from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

- .3 Packaging Waste Management: Remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Waste Management Plan, in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Copper long barrel compression connectors to CSA C22.2 No. 65 as required, sized for conductors.
- .2 2, 3, or 4-way joint boxes CEMA 4X type in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems.

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 connectors and terminations 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 Bond and ground as required to CSA C22.2 No. 41.

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 reuse recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE):
 - .1 ANSI/IEEE 837-2014, 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 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in a clean, dry, and well-ventilated area.
 - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: Remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Waste Management Plan, in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 EQUIPMENT

- .1 Rod Electrodes: Copper clad steel 19 mm diameter by minimum 3 m long.
- .2 Grounding Conductors: Bare stranded copper, soft annealed, size as indicated.
- .3 Insulated Grounding Conductors: Green, copper conductors, size as indicated.
- .4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including, but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermic welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of 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 and accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to electrodes, using copper welding by thermic process, connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.

- .6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

3.3 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.4 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.

3.5 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 recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA).
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition (With Quebec modifications).

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 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Quebec.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 JUNCTION AND PULL BOXES

- .1 Construction: Welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: Screw-on flat covers.

Part 3 Execution

3.1 JUNCTION, PULL BOXES, AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous, but accessible locations.

- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 No junction and pull boxes are indicated. Install pull boxes as required by CSA C22.10.18.

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, system name, or as indicated.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition (With Quebec modifications).

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 manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.10.18.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

- .3 Utility boxes for outlets connected to surface-mounted conduit, minimum size 102 x 54 x 48 mm.

- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

2.3 CONDUIT BOXES

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

2.4 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.5 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 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .4 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .5 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International):
 - .1 CAN/CSA C22.2 No. 18.2-06, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04(R2009), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-06(R2013), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05(R2010), Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.3 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 reuse and recycling in accordance with Section 01 74 21 - 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 CONDUITS

- .1 Rigid Metal Conduit: To CSA C22.2 No. 45, aluminum, with epoxy resin base coat and polyester powder finish coating inside and outside.
- .2 Electrical Metallic Tubing (EMT): To CSA C22.2 No. 83, with couplings.
- .3 Rigid PVC Conduit: To CSA C22.2 No. 211.2 and 211.0.
- .4 Flexible Metal Conduit: To CSA C22.2 No. 56, liquid-tight flexible metal steel.

2.2 CONDUIT FASTENINGS

- .1 One-hole malleable iron straps with base to secure surface conduits 50 mm and smaller.
 - .1 Two-hole steel straps with base for conduits larger than 50 mm.
 - .2 Coating: Same as conduits.
- .2 Beam clamps to secure conduits to exposed steel work for interior only.
- .3 Channel type supports for two or more conduits at 600 mm on centre.

2.3 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.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

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

2.5 FISH CORD

- .1 Polypropylene.

2.6 CONDUIT COLOR

- .1 The color of ductwork and ductwork accessories used on the outside of the building, for the passage of conductors, and power and control cables, shall be the same as the exterior cladding of the building.

- .2 For this purpose, the Contractor must determine by sample, the color of the conduits and submit it to the Client for his approval.
- .3 After approval of the color, the Contractor must have the aluminum ducts and associated ductwork painted in accordance with the specifications. All ducts on the surface, outside the building, must be painted in the same color.

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 Surface mounted conduits.
- .2 Use epoxy and PVC coated conduit.
- .3 Use electrical metallic tubing (EMT) inside only.
- .4 Use rigid PVC conduit underground.
- .5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.
- .6 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than $\frac{1}{10}$ th of its original diameter.
- .7 Mechanically bend steel conduit over 19 mm diameter.
- .8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .9 Install fish cord in empty conduits.
- .10 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .11 Dry conduits out before installing wires.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to works lines.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to works lines.

3.5 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.

- .2 Waterproof joints (except PVC) with heavy coat of bituminous paint. For PVC conduits, all joints shall be glued.

3.6 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

- .1 Insulated Cable Engineers Association, Inc. (ICEA).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground, in accordance with manufacturer's recommendations in a clean, dry, and well-ventilated area.
 - .2 Store and protect cables from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: Remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan and in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 CABLE PROTECTION

- .1 38 x 140 mm planks pressure treated with clear copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of 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 CABLE INSTALLATION IN DUCTS

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

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.
 - .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds.
 - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance Tests:
 - .1 After installing cable, but before splicing and terminating, perform insulation resistance test with 1,000 V megger on each phase conductor.

- .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour, and conductors not under test.
 - .3 High Potential (Hipot) Testing.
 - .1 Conduct Hipot testing of original factory test voltage in accordance with manufacturer's and ICEA recommendations.
 - .4 Leakage Current Testing:
 - .1 Raise voltage in steps from zero to maximum values as specified by ICEA manufacturer for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by ICEA and manufacturer.
 - .3 Record leakage current at each step.
- .7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.4 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 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Provide shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

1.4 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Six spare fuses of each type and size installed up to and including 600 A.

Part 2 Products

2.1 FUSES - GENERAL

- .1 Fuse type references L1, L2, J1, R1, etc., have been adopted for use in this specification.
- .2 Fuses: Product of one manufacturer.

2.2 FUSE TYPES

- .1 Class L fuses.
 - .1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

- .2 Type L2, fast-acting.
- .2 Class J fuses.
 - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 - .2 Type J2, fast acting.
- .3 Class R -R fuses.
 - .1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.
 - .2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 - .3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.
- .4 Class C fuses.

Part 3 Execution

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
 - .1 Install rejection clips for Class R fuses.
- .3 Ensure correct fuses fitted to assigned electrical circuit.
- .4 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA).
 - .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national Standard with UL 489, and NMX-J-266-ANCE-2010).

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 circuit breakers and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Include time-current characteristic curves for breakers with ampacity of 200 A and over, with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.
- .4 Certificates:
 - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet Standards and Regulations.
 - .1 Production certificate of origin must be submitted to Departmental Representative for approval.
 - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
 - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
 - .4 Production certificate of origin must contain:
 - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
 - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.

- .3 Contractor's name and address and person responsible for project.
- .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
- .5 Name and address of building where circuit breakers will be installed:
 - .1 Project title: [_____].
 - .2 End user's reference number: [_____].
 - .3 List of circuit breakers: [_____].

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 circuit breakers in dry location, indoors, off ground, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers: To CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: Quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 Circuit breakers to have minimum 10 kA.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

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 Install circuit breakers.

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: 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 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI).
 - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 CSA Group (CSA).
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters Laboratories of Canada (ULC).

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 data sheet, and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Departmental Representative.
 - .3 Photometric data to include: VCP Table where applicable.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 SPOTLIGHTS

- .1 Circular Spotlight.
 - .1 Description: The spotlight is a high-performance for lighting architectural exteriors and facades. It has numerous options including optics for flood or accent lighting, a choice of colour temperatures and colors, as well as various mounting options, accessories, spread lenses, and controls.
 - .2 Yoke: Short yoke, ANSI C136.31 (vibration rating 3G) and corrosion-resistant coating for hostile environments.
 - .3 Warranty: 5-year limited warranty.
 - .4 Performances:
 - .1 Delivery output: 8 425 lm (4 000 K, 4° optic).
 - .2 Delivered intensity: 593,570 cd at nadir (4 000 K, 4° optic).
 - .3 Illuminance at distance: Minimum 1fc à 234,7 m (4 000 K, 4° optic).
 - .4 Colour consistency: 2 SDCM.
 - .5 Colour rendering: CRI 80+.
 - .6 Lumen maintenance: L70>120,000 hr (TA 25°C).
 - .5 Physical:
 - .1 Housing material: Low copper high pressure die-cast aluminum.
 - .2 Yoke material: Aluminum heavy (standard yoke included allowing 75° forward and 165 ° rearward pivoting).
 - .3 Lens material: Clear tempered glass.
 - .4 Hardware material: Stainless steel.
 - .5 Surface finish: Electrostatically applied polyester powder coat, custom colour and finish (RAL colour), with corrosion-resistant coating for hostile environments.
 - .6 Electrical and Control:
 - .1 Voltage: 100 to 277 V.
 - .2 Cable: Power and data in one cable (5#16 AWG), 3 m standard length.
 - .3 Resolution (DMX/RDM): 8 bits or 16 bits per fixture.
 - .4 Control: Control DMX/RDM.
 - .7 Environmental:
 - .1 Operating temperature: -25°C to 50°C.
 - .2 Ingress protection rating: IP66.
 - .3 Impact resistance rating: IK09.
 - .8 Accessories:
 - .1 Control box: Power and control box - continuous and daisy chain layout.

- .9 Connection: Daisy chain layout (DMX / RDM), including control and power boxes, wiring, junction boxes, hardware, and accessories.
 - .1 DMX/RDM controller.
 - .2 DMX Input.
 - .3 DMX output.
 - .4 Control and power box.
 - .5 Power input (100-277 V).
 - .6 Power and data output to fixture.
 - .7 Junction box.
 - .8 Spotlight.
 - .9 Power and data wiring.
- .10 Certification: UL compliant.
- .2 Standard Linear Spotlight.
 - .1 Description: The standard white and static color linear spotlight is a high efficiency linear LED fixture that goes where no facade lighting has gone before. Available in 305 mm, 610 mm, 914 mm or 1,219 mm sections, this spotlight is the right fit for general urban structure, historical buildings and those hardest to reach places. It offers the full range of options and accessories for other members of the spotlight family, and can be configured with a wide number of options, including: optics for grazing, floodlighting or wall washing, a choice of outputs, various colour temperatures or colours, as well as various mounting options, finishes, accessories and control. This spotlight also offers a unique asymmetric distribution, providing outstanding uniformity and brightness for walls and signage.
 - .2 Coat: Corrosion-resistance coating for hostile environments.
 - .3 Warranty: 5-year limited warranty.
 - .4 Performance:
 - .1 Delivered output: 884 lm (15.25 W/m, 1,219 mm fixture, 4,000 K, 30° x 30°, DMX/RDM), 3 765 lm.
 - .2 Delivered intensity: 77,896 cd at nadir (15.25 W/m, 1,219 mm fixture, 4,000 K, 8° x 8°, DMX/RDM).
 - .3 Illuminance at distance: Minimum 1fc at 43.0 m (15.25 W/m, 1 219 mm fixture, 4,000 K, 10° x 60°, DMX/RDM).
 - .4 Colour consistency: 3 SDCM (2 SDCM for 8° x 8°, 10° x 10°, 10° x 30°, 10° x 60°, 10° x 90°, 30° x 10°, 60° x 10°, W, and WW optics).
 - .5 Rendering colour: IRC 80+.
 - .6 Lumen maintenance: L70 >120 000 hr., TA=25°C.
 - .5 Physical:
 - .1 Housing material: Low copper content extruded aluminum.
 - .2 Lens material: Clear tempered glass.

- .3 Hardware material: Stainless steel.
- .4 End cap material: Machined aluminum.
- .5 Gasket material: Silicone.
- .6 Surface finish: Electrostatically applied polyester powder coat, custom colour and finish (RAL colour), with corrosion-resistant coating for hostile environments.
- .6 Electrical and Control:
 - .1 Voltage: 120/277 V c.c.
 - .2 Resolution (DMX/RDM): 8 bits or 16 bits per fixture.
 - .3 Control: DMX/RDM control (compatible with 0-10 V or DMX/RDM systems).
- .7 Environmental:
 - .1 Storage temperature: -50°C to 85°C (device must reach start-up temperature value before operating).
 - .2 Start-up temperature: -25°C to 50°C.
 - .3 Operating temperature: -25°C to 50°C.
 - .4 Ingress protection rating: IP66.
 - .5 Impact resistance rating: IK08 (IK09 for 1,219 mm fixture).
- .8 Accessories:
 - .1 Cables: Junction cable, main power cable, and main data cable.
 - .2 Power and control box and splitter box.
 - .3 Optical accessories: Louvre and visor.
- .9 Mounting: Fixed mounting and universal ajustable mounting.
- .10 Connection: Continuous run - daisy chain layout (200 W), including:
 - .1 Dimmer/controller.
 - .2 Power input (120-277 V).
 - .3 Data input.
 - .4 Power and control box (200 W).
 - .5 Power output.
 - .6 Date output.
 - .7 Master jumper cable.
 - .8 Standard linear spotlight.
 - .9 Jumper cable.
 - .10 Terminator cap.
- .11 Certification : UL compliant.
- .3 Small Linear Spotlight.
 - .1 Description: The small white and static color linear spotlight is a high efficiency linear LED fixture that goes where no facade lighting has gone before. Available

in 305 mm, 610 mm, 914 mm or 1,219 mm sections, this spotlight is the right fit for general urban structure, historical buildings and those hardest to reach places. It offers the full range of options and accessories for other members of the spotlight family, and can be configured with a wide number of options, including: optics for grazing, floodlighting or wall washing, a choice of outputs, various colour temperatures or colours, as well as various mounting options, finishes, accessories, and control. This spotlight also offers a unique asymmetric distribution, providing outstanding uniformity and brightness for walls and signage.

.2 Coat: Corrosion-resistance coating for hostile environments.

.3 Warranty: 5-year limited warranty.

.4 Performance:

- .1 Delivered output: 884 lm (6.6 W/m, 1,219 mm fixture, 4,000 K, 30° x 30°, DMX/RDM), 1,767 lm (13.1 W/m, 1,219 mm fixture, 4,000 K, 30° x 30°, DMX/RDM).
- .2 Delivered intensity: 20,676 cd at nadir (6.6 W/m, 1,219 mm fixture, 4,000 K, 8° x 8°, DMX/RDM), 41,352 cd at nadir (13.1 W/m, 1,219 mm fixture, 4,000 K, 8° x 8°, DMX/RDM).
- .3 Illuminance at distance: Minimum 1fc at 43.9 m (6.6 W/m, 1,219 mm fixture, 4,000 K, 8° x 8°, DMX/RDM, minimum de 1 fc at 61.9 m (13.1 W/m, 1,219 mm fixture, 4,000 K, 8° x 8°, DMX/EDM).
- .4 Colour consistency: 3 SDCM (2 SDCM for 8° x 8°, 10° x 10°, 10° x 30°, 10° x 60°, 10° x 90°, 30° x 10°, 60° x 10°, W, and WW optics).
- .5 Rendering colour: IRC 80+.
- .6 Lumen maintenance: L70 >90,000 hr.

.5 Physical:

- .1 Housing material: Low copper content extruded aluminum.
- .2 Lens material: Clear tempered glass.
- .3 Hardware material: Stainless steel.
- .4 End cap material: Machined aluminum.
- .5 Gasket material: Silicone.
- .6 Surface finish: Electrostatically applied polyester powder coat, custom colour and finish (RAL colour), with corrosion-resistant coating for hostile environments.

.6 Electrical and Control:

- .1 Voltage: 48 VDC.
- .2 Resolution (DMX/RDM): 8 bits or 16 bits per fixture.
- .3 Control: DMX/RDM control (compatible with 0-10 V and DMX/RDM systems).

- .7 Environmental:
 - .1 Storage temperature: -50°C to 85°C (device must reach start-up temperature value before operating).
 - .2 Start-up temperature: -25°C to 50°C.
 - .3 Operating temperature: -40°C to 50°C.
 - .4 Ingress protection rating: IP66.
 - .5 Impact resistance rating: IK08 (IK09 for 1,219 mm fixture).
- .8 Accessories:
 - .1 Cables: Junction cable, main power cable, and main data cable.
 - .2 Low-voltage power and control box and low-voltage splitter box.
 - .3 Optical accessories: Louvre and visor.
- .9 Mounting: fixed mounting and universal ajustable mounting.
- .10 Connection: Continuous run - daisy chain layout (200 W), including:
 - .1 Dimmer/controller.
 - .2 Power input (120-277 V).
 - .3 Data input.
 - .4 Power and control box (200 W).
 - .5 Power output.
 - .6 Date output.
 - .7 Master jumper cable.
 - .8 Small linear spotlight.
 - .9 Jumper cable.
 - .10 Terminator cap.
- .11 Certification : UL compliant.

2.2 TYPE E LUMINAIRES

- .1 Description:
 - .1 High efficiency LED luminaire with low copper cast aluminum radiator and polycarbonate base with knock-out opening for accessibility to electrical connection terminals. The luminaire has a universal mounting base and allows the connection of 12 AWG to 20 AWG cables.
 - .2 The LED unit is enclosed in a frosted glass globe.
 - .3 The supply voltage is 120 to 277 V at 50 and 60 Hz.
 - .4 The power factor is 0.90 at full load.
 - .5 The total harmonic distortion is less than 20% at full load.
 - .6 The operating temperature range is from -30°C to +40°C.
 - .7 A 6-kV overvoltage protection is incorporated in the luminaire and complies to IEEE / ANSI C62.41.2.

- .8 The luminaire is approved for installation in damp locations.
- .9 The luminaire power is 34 W.
- .10 The color temperature of the luminaire is 3,000 K and the corresponding luminous flux is 3,400 lumens.
- .11 The system efficiency is over 99% and the color rendering index is 77.
- .12 The product has a 10-year warranty.

2.3 LUMINAIRES

- .1 As indicated on drawings.

2.4 LIGHTING CONTROL SYSTEM

- .1 General:
 - .1 Complete programmable and standalone digital lighting control system including a touchscreen and a 100 Universe DMX controller for real-time lighting network control, cabling and accessories to form a control system Complete and functional.
 - .2 The system allows to implement dynamic and precise lighting installations, pre-programmed and personalized sequences, while offering a possibility of manual control in real time.
- .2 Description:
 - .1 The controller must be a microprocessor system specially designed for lighting control in an architectural or entertainment application. A personal computer running emulation software is not acceptable.
 - .2 The controller must have a fully integrated capacitive touch screen, driven by the application run on the microprocessor. A Web browser displaying content that is broadcast remotely is not acceptable.
 - .3 The touch screen application must be dedicated to displaying a user interface for the controller. No other process should be run.
 - .4 The appearance and content of the user interface can be customized by the user.
 - .5 The user interface can be used in landscape or portrait orientation.
 - .6 The controller must store the broadcast data and user interface configuration in a non-volatile semiconductor memory. This memory must be removable for backup or disaster recovery purposes.
 - .7 Display data and user interface configuration can be downloaded from a remote personal computer via an Ethernet connection.
 - .8 The controller's operating system must be stored in non-volatile, non-removable electronic memory. It is possible to update the operating software by downloading from a remote personal computer via an Ethernet connection.
 - .9 The controller must start displaying the playback and display the user interface on the touchscreen automatically when the power is received without additional external input.

- .10 The controller must have a real-time internal clock that continues to operate in the absence of external power. It must be able to adapt automatically to daylight saving time and can be updated via the Internet using the Network Time Protocol (NTP).
- .11 The Controller shall be able to calculate the hours of sunrise and sunset based on longitude and latitude information and use them as event triggers.
- .12 The controller must have a capacity of 512 channels of output control of EDMX protocols, including ART-Net II, Kinet, SACN and Pathport by universe and with a capacity of 100 universes in total.
- .13 The controller must be able to emit several EDMX protocols simultaneously, up to the limit of the output control channel.
- .14 The controller must be able to emit eDMX protocols over a different IP network to its IP management network.
- .15 There must be visual indicators on the controller indicating the status of the controller and its interfaces.
- .16 The controller must operate a WEB server on its Ethernet interface. This should provide remote access to state information, control, and configuration options.
- .17 The appearance and content of the Web interface can be customized by the user.
- .18 The controller shall allow the illumination to be programmed as separate zones, with independent triggering and manual intensity control.
- .19 The controller must support multiple scenarios, crossfades, and effects running simultaneously.
- .20 The controller must support the playback of video media with individual pixels mapped to lighting fixtures in a matrix.
- .21 The controller shall support an ambient light sensor that can be used for daylight collection and configured to automatically adjust the brightness of the display backlight.
- .22 The controller must support a proximity sensor, which can be used for triggers and to "wake-up" the screen after a period of inactivity.
- .23 The controller must support an IR learning sensor.
- .24 The controller must support a temperature sensor, which can be used for tripping.
- .25 The controller must be able to provide feedback through the user interface.
- .26 The controller shall be able to receive ART-Net II for triggering.
- .27 The controller must support multiple remote devices connected via Ethernet to support additional show control interfaces, such as contact closures, analog inputs, relay outputs, a serial input, an audio input, a linear time code, MIDI, and DALI.
- .28 The controller must support multiple remote-control panel stations via Ethernet for use as triggers and for user feedback.
- .29 The controller must support several streams of linear timecode and audio data within the same networked system.

- .30 The controller must have a recessed switch to reset the unit without turning off the power.
- .31 The controller must have a recessed switch to launch the internal configuration menu.
- .32 No physical buttons should be visible or exposed when the controller is properly installed.
- .33 The controller must have an internal monitoring function that will restart the unit in the event of a program failure.
- .34 Multiple controllers must automatically synchronize and share triggers when programmed as part of a single program and linked via Ethernet during playback.
- .35 The controller must support conditional logic and execute user-defined Lua scripts to support advanced display control operations.
- .36 The controller must be supplied with a 5-year manufacturer's warranty.
- .3 Physical Dimensions and Characteristics:
 - .1 Capacitive touch screen will be 4.3 inches with a resolution of 480 x 272 and 24 bytes of definition.
 - .2 The unit must be installed in a double box (depth 35 mm) or a custom box of 2.5 inches.
 - .3 The construction of the unit shall be fitted with mounting screws and technician tools concealed under a magnetic coating which must rest inside the Screen.
 - .4 The unit must be fully solid-state, without moving parts, fans or hard drive drives.
 - .5 The unit must operate in a temperature range from 0°C to 50°C (32°F to 122°F).
 - .6 The unit must conform to this.
 - .7 The unit must be listed as ETL/CETL.
- .4 Supply:
 - .1 The controller must support the following standard connectors:
 - .1 A PRJ45 Rise for 10/100base-TX Ethernet
 - .2 The controller must be able to receive an Ethernet power supply (IEEE 802.3 af PoE-powered device).
- .5 Software:
 - .1 The controller must be supported by programming software running on a PC or MAC platform. The programming features must include:
 - .1 Has. Complete and automated Library of architecture.
 - .2 Functionalities of slide and drop to position Fixtures on the map.
 - .3 Functionalities of slide and drop the spotlight patches on the output addresses.
 - .4 Importing any media for mapping to mounting matrices.
 - .5 Timeline-based programming and playback.

- .6 Wide range of modifiable effects presets.
- .7 Functionalities of drag and drop placement of effects presets and media on timeline.
- .8 Variety of trigger options to trigger system-wide events.
- .9 Each trigger event can be configured to trigger one or more lighting or control actions.
- .10 Each trigger event can be configured to test one or more conditions before performing its actions.
- .11 Simulating individual deadlines and an entire project with triggers.
- .12 Live release of the software for program verification purposes.
- .13 Network management controller tools.
- .14 Exportation of TSV reports for all aspects of programming. Remote content Management and program programming tools. The controller must be supported by user interface software running on a PC or MAC platform. The user interface configuration features must include:
 - .1 Creation of multiple pages of user interface controls.
 - .2 Layout library with buttons, sliders, and color selectors.
 - .3 Modification of the appearance of pages and controls by applying themes.
 - .4 Use library Themes or create custom themes.
 - .5 Choose a background image for each page.
 - .6 Attributes a local functionality to controls. Modification of the brightness of the page or screen.
 - .7 Adding navigation commands to pages and configuration of page transitions.
- .6 Accessories:
 - .1 All accessories, such as cabling, connectors, brackets, mounting accessories, power and control boxes, drilling holes, anchorages, conduits, connectors, power and control circuits, and hardware, must be supplied and installed.

2.5 DIGITAL SCREEN

- .1 Technical description of the digital screen:
 - .1 The resolution of the screen is 6.67 mm. The large size of the screen provides a good matrix of pixels.
 - .2 Diodes: The diodes are of SMD type, offering a brightness higher than 6,000 nits (cd/m²) for the screen 6.67 mm (22,500 pixels/m²). The SMD diodes used come from well-filtered lots with uniform color. The diodes are bright and durable because they have a minimum life of 100,000 hours.
 - .3 Angles of view: The screen offers a wide angle of view: 140° horizontal and 140° vertical.

- .4 View distance: The minimum viewing distance for a 6.67 mm screen is 6 m (20 ft.).
- .5 1/6 scan technology: Due to the high density of diodes offered by the 6.67 mm display, this new technology allows 80% more diodes to be lit with the same power consumption.
- .6 Color screen: The color display panel with RGB technology, offers 281 billion colors.
- .7 Aluminum cabinets: The cabinets are made of 100% aluminum to eliminate corrosion and reduce the weight of the unit to a minimum.
- .8 Sealing: The LED modules and housing comply with ingress protection (IP) IP65 standards for maximum protection.
- .9 Temperatures: The panel is constructed to operate at temperatures ranging from -40°C to +60°C.
- .10 Sealed modules with easy release system.
- .11 Each module is sealed to provide maximum weather protection for the Canadian climate.
- .12 The digital screen service is fully forward thanks to the easy release system for quick and easy service.
- .13 Automatic brightness adjustment: The digital display is equipped with an automatic brightness control system. The system automatically and gradually decreases the intensity of the panel in relation to the external brightness. At night, the panel is programmed to meet the most stringent lighting standards in force.
- .14 Power supply blocks: We use high-performance power supplies, known in the field of digital signage. The high-performance model used operates in temperatures from -40 ° C to + 60 ° C with automatic ventilation and built-in surge protectors. In addition, they are equipped with the PFC "Power Factor Control" function which measures the current and saves up to 25% power consumption.
- .15 Integrated circuits with high refresh rate:
 - .1 The modules are manufactured with renowned MBI branded ICs delivering extraordinary performance for videos and animations. The refresh rate reaches 1,920 Hz for high quality image diffusion.
- .16 Guarantee of 5 years parts and 2 years manpower. The manufacturer offers a 5-year warranty parts and 2 years manpower on the digital screen. The warranty covers any defect of the screen during normal use. The warranty does not cover damage caused by vandalism or accident.
- .17 The manufacturer must have in stock the replacement parts for a repair performed in less than 24 hours.
- .18 Life of the device:
 - .1 The diodes are designed to last 100,000 hours of use. This represents 10 years of operation 24/7.

- .19 High definition control system:
 - .1 The high-definition control system has a powerful video processor that can stream images of any format instantly in real time.
- .20 Industrial computer:
 - .1 A state-of-the-art industrial computer will be used to manage the digital display and provide access to the technical service to diagnose or modify settings remotely.
- .21 Communication with the screen:
 - .1 Two data cables will have to be installed between the screen and the control room where the high definition controller and the industrial computer will be located.
- .22 CAN-ICES-3 Certification: Digital displays must comply with Industry Canada's ICES-3 Interference Standard and carry the certification seal.
- .23 Practical software for creating content and controlling the screen. The software makes it possible to create images, videos, animations and transparencies from a web software. The software allows the integration of the weather, any web pages, RSS, etc. The software is adapted to the display matrix of the digital screen. All content is stored on a secure web server and is accessible from a computer, tablet or phone.
- .24 Control cabinet incorporating all equipment of screen control equipment rack-mount type.
- .25 Characteristics:

DESCRIPTION	SPECIFICATIONS
High Brightness	SMD LED Type
Overall Dimensions	4.80 m x 12.16 m (189" W x 478 ¾" H)
Cabinet Dimensions	0.96 m x 0.96 m x 0.150 m (37¾" L x 37¾" H x 5⅞" D)
Area	58.37 m²
Brightness	7,000 nits (cd/m²) minimum
Refresh Rate	1,920 Hz
Weight	1,868 kg (4,119 lb)
Distance View	6 to 125 me
Density	22,500 pixels/m²

DESCRIPTION	SPECIFICATIONS
Certifications	ETL, CE, CSA CAN-ICES-3 NMB-003
Warranty	5 years parts and 2 years labor
Image Resolution	720 x 1,824 pixels
Pitch	P6.67 - 1 RGB Pixel Per 6,67 mm Display
Power consumption	35,665 W maximum 12,483 W average
Scan Type	1/6 scan, saves 83% in electricity
Power	120 V/400 A 240 V/200 A
Temperatures	-40°C to +60°C
Power Supply Blocks	High Performance with PFC Energy Saving
Sources	Images, video, text, animations
Durability	100,000 hours
Waterproof	IP65
Viewing Angles	Horizontal 140° Vertical 140°
Aspect	15/38
LED Modules	320 x 320 mm with weatherproof connectors
Diodes	2727 SMD Type high brightness R 619 – 625 nm G 520 – 525 nm B 470 – 475 nm 100,000 hours life expectancy

.26 Software with Web access:

- .1 The manufacturer offers the possibility to control your digital screen 100% on the Web.
- .2 The software is accessible from any site via the web and the billboard can be controlled remotely.

.27 Installation support:

- .1 The digital display panel is supplied with all brackets and anchors for wall mounting.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install the systems as indicated.
- .2 Luminaires and yoke must be installed with earthquake-resistant stainless-steel cable.

3.2 WIRING

- .1 Connect the equipment to electrical and control circuits:
 - .1 Install wiring in rigid conduit.

3.3 LIGHTING CONTROL AND DIGITAL SCREEN PANEL SYSTEMS

- .1 Install control.
- .2 Make power and control connections.
- .3 Perform addressing and programming of lighting; for this purpose, the Contractor must retain the services of the manufacturer.
- .4 Perform tests.
- .5 Dispose of waste materials.

3.4 CLEANING

- .1 Clean and remove surplus materials, excess materials, rubbish, tools, and equipment.

END OF SECTION

DIVISION 28

Partie 1 Generalities

1.1 SCOPE OF WORK

- .1 The objective of the current section is to communicate the requirements related to the installation of a retractable bollards system in the ICAO public place.
- .2 Contractor shall provide and install the bollards, the control units for the bollards and all required accessories to allow for a complete, functional solution.
- .3 Contractor shall provide, install and configure a command console equipped with push buttons to allow for the remote operation of the bollards at the security control post.
- .4 Conduits and power circuits for the cabling and operations of the bollards are described in Section 26 - Electrical
- .5 Foundation, armature, type and installation of concrete, including soil bearing capacity and backfilling requirements as well as drainage conduits for the bollards are described in section 31 and 33.
- .6 Contractor shall coordinate work with all trades and parties to ensure a complete and functional solution.

1.2 RELATED SECTIONS

- .1 Section 26 05 00 – Common work results for electrical

1.3 REFERENCES

- .1 CSA C22.1, Canadian Electrical Code, Part I (26th Edition), Safety Standard for Electrical Installations.
- .2 Canadian electrical code, Part I (21st edition), with Quebec amendments.
- .3 ASTM INTERNATIONAL (ASTM)
 - .1 ASTM F 2656M-15 (2015) Standard Test Method for Crash Testing of Vehicle Security Barriers.
- .4 U.S. DEPARTMENT OF STATE (DOS)
 - .1 SD-STD-02.01 (2003; Rev A) Specification for Vehicle Crash Test of Perimeter Barriers and Gates.
- .5 BRITISH STANDARDS INSTITUTION (BSI)
 - .1 PAS 68:2013 (2013) Impact test specifications for vehicle security barrier systems.
- .6 INTERNATIONAL STANDARDS ORGANISATION (ISO)
 - .1 IWA 14-1:2013 (2013) Vehicle security barriers – Part 1: Performance requirement, vehicle impact test method and performance rating.

1.4 PERFORMANCE REQUIREMENTS

- .1 Contractor shall provide retractable bollards certified for withstanding impacts from one of the following ratings:
 - .1 K8 as described U.S. DEPARTMENT OF STATE (DOS) SD-STD-02.01 (2003; Rev A) Specification for Vehicle Crash Test of Perimeter Barriers and Gates.
 - .2 M40 as described ASTM F 2656M-15 (2015) Standard Test Method for Crash Testing of Vehicle Security Barriers.
 - .3 N3 7500-65 as described PAS 68:2013 (2013) Impact test specifications for vehicle security barrier systems.
 - .4 N3 7500-65 as described IWA 14-1:2013 (2013) Vehicle security barriers – Part 1: Performance requirement, vehicle impact test method and performance rating.
- .2 Contractor shall install a retractable bollard system from a known manufacturer that must demonstrate an extensive experience in the installation of these bollards systems. The Contractor shall have participated in at least 2 similar installation of crash rated bollards as described in 1.4.1 above, within the last 5 years.
- .3 Before work acceptance, Contractor shall request that the bollards manufacturer obtain a conformity certificate attesting that the installation meets CSA standards for installation in Canada.
- .4 Installation distances between bollards shall be identical to the “approved” distances measured during the manufacturers’ certification testing.
- .5 Operation speed: Retractable bollards shall be able to move completely down within 3 seconds and rise within 3 to 7 seconds in normal conditions. Rising speed in Emergency Fast Operation (EFO) shall be faster than 3 seconds.
- .6 The retractable bollard system shall be designed to operate for a minimum of 60 complete cycles (open/close) per hour, 24 hours a day, 365 days a year. The system shall be designed to maintain its last position and remain in that position, without power, inspection or activation, for a period that could last up to 4 weeks.
- .7 The retractable bollard system shall be designed to operate in temperatures ranging from -30°C et 55°C with or without a heating module. The Contractor shall obtain from the manufacturer a list of anti-corrosion treatment and apply these treatments at the end of the installation and during the warranty period.
- .8 The retractable bollard system shall be operable from a single-phase electrical power source of 208VAC at a frequency of 60 Hz. The bollards control unit shall be operable from the same source.
- .9 Movement direction of the bollards shall be instantly inverted upon command, whichever is the current direction.
- .10 The retractable bollard system shall be able to operate continuously without failing due to overheating or low environmental temperature.

- .11 The Contractor and bollard manufacturer shall certify that the components have been designed and tested to the similar site conditions (temperature, rain, snow, freezing rain, hail, circulation density, maintenance quality, abrasive usage, etc.)
- .12 The retractable bollard system shall be designed to be operated regularly at the planned location. Contractor shall demonstrate the success of a prior similar installation in similar site conditions, including frequency and level of maintenance required.
- .13 The retractable bollard system and all associated components shall allow local technicians to carry out routine maintenance without requiring heavy machinery or other specialised tools or knowledge.
- .14 The bollards must be integrated in a self-contained burial assembly. With the extinction of the electrical control module, all elements required for the operation of the bollard shall be located directly in the same the bollards.
- .15 The panels and enclosures for the retractable bollards system shall be accessible in order to facilitate and secure the maintenance and repair process.
- .16 The system shall be designed in order to be maintained in an elevated position in the even of an electrical, hydraulic or mechanical failure. The system shall be equipped with a manual operation procedure in case of emergency, or electrical, mechanical or hydraulic failure.
- .17 The manual operation of the retractable bollards shall be simple and shall not require any specialized tools or knowledge. It shall be possible to lower the entire bollard row within 5 minutes.
- .18 The system shall be equipped with a locking mechanism to secure the bollards in elevated position.
- .19 The bollards control unit enclosure shall be lockable by high security-controlled reproduction key. Contractor shall deliver the authorization card for reproductions to the Client Representative, at the end of the installation. When applicable, Contractor shall provide heating and ventilation modules in the enclosures to maintain continued operations of accessories and components within local temperature conditions.

1.5 FUNCTIONAL REQUIREMENTS

- .1 The bollards control unit shall be installed in the building, connected to the bollards dans to a push button command console to allow for the remote operation of the bollards from the security control post.
- .2 The command console shall, minimally, include the following push buttons and indicators:
 - .1 Button to lower the bollards;
 - .2 Button to raise the bollards;
 - .3 Button to stop bollard movement;
 - .4 Emergency operation (EFO) button to allow accelerated raising of the bollards;
 - .5 Button to silence local audible alarm;

- .6 Indicator light, activated when all bollards are completely down;
- .7 Indicator light, activated when all bollards are completely up;
- .8 Indicator light, activated when the bollards system is seeing a trouble condition or maintenance is required;

1.6 CONTRACTOR SUBMITTALS

- .1 Submit the following documents:
 - .1 Specification sheets for all cable types;
 - .2 Specification sheets for all equipment to be provided in the current section, optional equipment and all required accessories;
 - .3 Manufacturer instructions related to the assembly and installation of all equipment and materials;
 - .4 Manufacturer operation and maintenance manuals;
 - .5 A copy of the bollards system programming, as applicable, including comments and directives.
- .2 Submit the following shop drawings:
 - .1 Single line diagram of the power circuit from the electrical panel, the inputs/outputs between the bollards control units, command consoles and retractable bollards.
 - .2 All relevant manufacturer issued documentation that allows for the validation of specifications, performance criteria, dimensions, finishing and limits of each products.
 - .3 Wiring diagram and installation details of devices indicating the proposed location, implementation, trajectory and disposition. Accessories, conduits, drainage conduits and all other elements shall be shown to demonstrate that the final installation was coordinated between all trades.
 - .4 Indicate all required clearances on the drawings, as required for the operation, maintenance and replacement of all equipment.
 - .5 For the retractable bollards, provide spacing, dimension, material type, list of components, electrical power requirements, speed of operation and foundation details. Foundation details shall include the following information:
 - .1 Size of the foundation, configuration of the armature, concrete type, including soil bearing capacity and backfilling requirements. Details shall be adjusted according to the specific project conditions, as recommended by the manufacturer, in order to certify that the installation meets standard product performance and meets the K8/M40/N3 7500-65 resistance to impacts.
 - .2 The foundation details shall be adjusted for a bollard spacing that does not exceed 48" between bollards.
- .3 Shop drawings shall be signed and stamped by the manufacturer and an authorized Quebec Engineer.

- .4 Obtain, from the manufacturer, the CSA conformity certificate as submitted by an approved technical expert from the CSA group. This certificate must be submitted for approval.
- .5 The manufacturer or an approved representative, shall carry out a site inspection before the pouring of the concrete for the bollard foundation. After the installation, the manufacturer shall provide a document certifying that the installation was executed in complete conformity with their recommendations, contractual documents and specific site conditions, in order to meet all listed and described performance requirements.
- .6 Test reports. At the end of the installation, submit a complete test report demonstrating the conformity to the current section's requirements as well as the full description of the tests and adjustments done before and after the tests.
- .7 Submit operation manuals for each equipment:
 - .1 Submit 3 paper copies and 1 digital copy at least 2 weeks before the training period. The manuals shall be submitted for approval.
 - .2 Operation instructions detailing the step by step procedures to start, operate and stop the system. The manual shall include the name of the manufacturer, model number, list of components and a brief description of their characteristics and their functions.
 - .3 Maintenance instructions detailing the procedures to follow for routine maintenance, diagnostics and repair in the event of damaged components. The manual shall include a wiring and control diagram, a conduit layout and a drawing illustrating the location of all equipment.
- .8 Spare parts. Following the approval of shop drawings, the Contractor shall submit a list of spare parts for all equipment. The list shall include unit prices.
- .9 The training program shall take into account the entire operation process of the bollards (bollard control unit and command console):
 - .1 Submit a training program for site personnel covering the procedures and instructions on how to operate the bollards and procedures to follow in the event of a power failure.
 - .2 Submit a training program for maintenance personnel to diagnose any issues with the system.
 - .3 Submit a training program for the manual and local operation of the system.

1.7 QUALITY ASSURANCE

- .1 Contractor shall submit, when proof is required, that the personnel assigned to the project and their organisation have obtained a certification from the manufacturer indicating that they are qualified to install, connect and commission the system.
- .2 Contractor shall demonstrate a relevant expertise in the installation of a retractable crash rated (ASTM F 2656M, SD-STD-02.01, PAS 68, IWA 14-1) bollard system where the deployment and integration to other systems was carried out successfully.

Partie 2 Products

2.1 RETRACTABLE BOLLARDS

- .1 The retractable bollards shall meet or exceed the following requirements:
 - .1 Stainless steel finish.
 - .2 Meet the impact resistant performance level of K8, N3 7500-65 and/or M40 according to the test conditions described in DOS SD-STD-02.01, PAS 68, IWA 14-1 and/or ASTM F2656.
 - .3 Equipped with a heating module allowing for the operation to temperatures reaching -30 °C.
 - .4 Cover fixed on the cylinder with tamper proof screws.
 - .5 Equipped with an external or integrated light and audible indicator.
 - .6 Connection for drainage conduit.
 - .7 Operation with site available power source.
 - .8 Connection for distinct control cabling and power cabling conduits.
 - .9 Diameter of no less than 200 mm.
 - .10 Height of 900 mm (+/- 5%)
 - .11 Hauteur hors sol de 900 mm (+/- 5%).
 - .12 Equipped with an emergency fast operation command (EFO).
 - .13 Self-contained operator, integrated with bollard assembly.
- .2 If required, hydraulic oil used in cylinders shall allow for a viscosity level adapted to local operating temperatures while being biodegradable.
- .3 Reference product: EB3608-8 M40 from SecureUSA or equivalent approved during the tender process following procedure outlined to proponents.

2.2 CONDUIT, CONNECTION AND ELECTRICAL CABLING

- .1 Description for the supply and install of the conduits is in Section 26 - Electrical.
- .2 Contractor shall ensure that the dimension of conduits as described in the electrical drawings are appropriate for the proposed equipment, cabling and functionalities. If the Contractor determines that the dimensioning of the conduits is insufficient, they must inform the Ministerial Representative and demonstrate that the dimensioning needs to be changed, several weeks prior to the Electrical Work being carried out at the site.
- .3 The provision and installation of the power source up to the bollard control unit is described in Section 26 – Electrical.

2.3 PUSH BUTTON COMMAND CONSOLE

- .1 The Contractor shall provide and install an enclosure equipped with push buttons with indicator lights. The command console and its accessories shall meet or exceed the following requirements:
 - .1 Desktop mount metallic casing allowing for the installation of all buttons and light indicators.
 - .2 Round RED push button with LED light 24VDC, normally closed contacts (NC), diameter of 16 mm, labelled “HAUT”.
 - .3 Round GREEN push button with LED light 24VDC, normally closed contacts (NC), diameter of 16 mm, labelled “BAS”.
 - .4 Round WHITE push button with LED light 24VDC, normally closed contacts (NC), diameter of 16 mm, labelled “ARRÊT”.
 - .5 Mushroom RED round push button with LED light 24 VDC, two normally closed contacts (DPDT), diameter of 22 mm, reinitiate by turning, labelled “EFO”, with cover to prevent accidental operation.
 - .6 YELLOW LED light indicator 24VDC with audible alarm, diameter of 16 mm, labelled “TROUBLE”.
 - .7 Round YELLOW push button 24VDC, normally closed contacts (NC), diameter of 16 mm, labelled “SILENCE”.
 - .8 Lamacoid plate labelling each button and indicator light.
 - .9 Flexible metallic conduit from command console on the desk to the junction box under the desk.

2.4 BOLLARDS CONTROL UNIT (ELECTRICAL POWER UNIT) (EPU)

- .1 The control unit shall be of the same manufacturer as the bollards and specifically designed for the control of the proposed bollards models.
- .2 The control unit shall be compatible with the same power source as the Bollards. The power source is described in Section 26 – Electrical.
- .3 Provide the number of control unit recommended by the manufacturer for the number of deployed bollards.
- .4 Provide the required relay modules to connect the outputs and inputs of the control unit to the command console.
- .5 Provide all accessories required for the optional and/or external modules of the bollards (lights, audible alarm, heater, etc.)
- .6 Control unit shall be installed in a lockable NEMA 4 metallic enclosure.

Partie 3 Execution

3.1 COORDINATION

- .1 Contractor shall coordinate their work with all other concerned trades.
- .2 All communication cables and accessories to install and connect the control unit to the bollards and the command console shall be provided and installed by the Contractor.

3.2 SHIPPING, HANDLING AND STORING

- .1 As much as possible, the Contractor shall deliver factory prefabricated, prefinished equipment. Avoid dismantling equipment when possible, when delivering, handling and storing.
- .2 Contractor shall conform to the Client's requirements for packing, handling, protecting, storing and delivering equipment. At the time of reception on site, Contractor shall inspect material to ensure there were no damage during delivery and/or handling. The Contractor shall replace every damaged equipment with no additional charge to the client. The following protective measures shall be ensured on site:
 - .1 Protect all stored equipment from the weather, large temperature variations, dirt, dust and all other contaminant on site. Store the structural elements on wood pallets and protect them from harmful elements, such as rust, dirt, grease or oils.

3.3 INSTALLATION

- .1 Contractor shall provide manufacturer's statement certifying that the Contractors is an approved installer. Shop drawings and installation details prepared by the Contractor shall be approved by the manufacturer prior to being sent to the Engineer. Following installation, Contractor shall provide a written statement from the manufacturer certifying that the installation was carried out according to the manufacturer's standard.
- .2 Contractor shall coordinate with other trades to ensure excavation, pouring, compacting and installation according to the manufacturer's installation instruction, in order to meet the impact resistance performance described in the product's specification sheets.
- .3 Install the bollards units at the pavement level. Contractor shall coordinate with other trades to ensure no water accumulation shall be present on the bollards, while respecting the pavement slope.
- .4 PVC conduits are described in Section 33 – Utility services, to allow for the drainage of the bollards' installation towards a pluvial network. Ensure coordination of work with other trades.
- .5 Install and connect the control units while configuring the inputs/outputs as required to ensure functionalities described within this document.
- .6 Install and connect the command console at the security control center. The console must allow for the remote operation of the bollards and, on a single glance, observe the status

of the bollards. All buttons and light indicators shall be labelled with a lamacoid plate with carved letters. Labels shall be in English and French.

3.4 OPERATION SEQUENCE

- .1 The operation sequence described below details the technical operation of the bollards and the control equipment as well as the operational procedure planned for the site personnel. The installation and configuration of the bollards and their accessories, as well as the training, shall reflect this operation sequence.
- .2 To lower or raise the bollards:
 - .1 The patroller moves to the bollards' location, validates that it is secure to operate the bollards and informs the operator in the security control post, by radio system (existing system)
 - .2 Operator activated the lowering or the raising of the bollards from the security control post on the command console with the "HAUT" push button or "BAS" button, as desired.
 - .3 Or a site technician follows the manufacturer's instruction for the manual lowering of the bollards.
- .3 When the bollards are moving (raising or lowering):
 - .1 The patroller shall supervise and control circulation to maintain a security clearance around the bollards and direct the vehicle crossing the bollard line.
 - .2 The light indicator of the HAUT or BAS buttons (depending on movement direction) flashes at the console. The audible alarm is activated at the console.
- .4 When the bollards are completely raised:
 - .1 The HAUT indicator light on the command console is activated.
 - .2 The bollards' lights are ON.
 - .3 The audible alarm is not activated.
 - .4 The patroller confirms, via radio, to the security control post that the bollards are raised.
- .5 Then the bollards are completely lowered:
 - .1 The BAS indicator light is activated.
 - .2 The audible alarm is not activated.
 - .3 The patroller confirms, via radio, to the security control post that the bollards are lowered.
- .6 To raise the bollards in emergency situation (EFO) :
 - .1 The operator activated the emergency fast operation using the "EFO" push button on the command console.
 - .2 The bollards lights are activated.
 - .3 All indicator lights on the command console shall flash. The audible alarm is activated.

- .7 The operator must be able to interrupt any movement sequence by pressing the ARRÊT button. The interruption shall maintain the bollards in the current position until the HAUT or BAS button is activated.
- .8 The operator must be able to interrupt audible alarm by pressing the Silence button at any time. The interruption shall maintain silence until the next event causing an audible alarm.

3.5 TESTING AND ADJUSTMENTS

- .1 At the end of the installation, carry out tests onsite on the retractable bollard system. Inform the client of the test period at least 7 days in advance. Carry out all corrections and adjustments required before proceeding with tests under the supervision of the Client.
- .2 The tests shall demonstrably verify all functionalities described for the local and remote control of the bollards. The tests shall also include the manual raising and lowering of the bollards.
- .3 The bollard row shall be lowered/raised continuously for a minimum of 30 minutes to validate that the heat accumulation within the system is sustainable.
- .4 Test the limit switched to validate that the lowered position of the bollards is adequate (and leveled). Adjust as required.
- .5 Depending on the type of operation of the bollard, test the safety pressure switch to validate proper functionality. Adjust as required.
- .6 All elements that are harmful to the normal operation of the retractable bollard system shall be corrected without additional charges to the Client. Adjustments and repair shall be carried out by the Contractor under the supervision of the Client representative. Following adjustments, tests shall be repeated until acceptance of the results by the Client.
- .7 Test the retractable bollard system by re-enacting the operation sequence as described by the current section. Test all functionalities and record activation time. Ensure the safety of the premises by limiting access to the pedestrians and vehicles during tests.

3.6 WARRANTY

- .1 Contractor shall provide a warranty on parts and labor of 1 years on all necessary components to the good operation of the retractable bollard system.
- .2 Warranty shall include a maintenance service. The maintenance service shall include inspection, adjustment, cleaning and replacement of used parts. A higher-level maintenance is required for a bollard row subject to the harsh environmental conditions in order to warrant the good operation of the system.
- .3 In the event of an issue with the system, the Contractor shall respond to the service call within 4 hours.
- .4 The manufacturer shall be able to provide additional phone support (emergency line) or online and be able to carry out remote diagnostic on the system.

- .5 The active elements of the retractable bollard system shall be constructed, provided and installed in order to be corrosion resistant and resist to other forms of decay that could be harmful to the system for a period of 5 years. If the replacement of a part is required due to corrosion, delivery or installation, the replacement will be carried out by the Contractor at no additional charge to the Client.

3.7 TRAINING

- .1 Contractor shall provide training for the system operators and maintenance personnel. Training shall be provided within 7 business days following the provisional work acceptance of the work. The training shall include:
 - .1 An overview of the system.
 - .2 The operation interface and controls.
 - .3 Manual operation of the bollards
 - .4 Safety measures.
 - .5 An onsite training to cover elements included in the operation manual.
- .2 Contractor shall provide a training session to supervisors. Training shall be provided within 7 business days following the provisional work acceptance of the work. The training shall include:
 - .1 An overview of the system.
 - .2 The operation interface and controls.
 - .3 Safety measures.
 - .4 The objective, the capabilities, options and limitations of the system.
- .3 At the end of the training session, the Contractor shall provide a certificate of completion to the Client, indicating:
 - .1 The date and length of the training.
 - .2 A signed list of the personnel who attended the training.
- .4 The training shall allow the personnel to carry out inspection, routine maintenance on the system in conformity with the manufacturer's recommendations.
- .5 All manuals, including operation, maintenance and repair shall be provided in paper and digital format. Two copied of these manuals, with relevant revisions, shall be delivered with the system during the commissioning phase.

END OF SECTION

DIVISION 31

Approved: 2012-06-30

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM D4791-10 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .2 Bureau de normalisation du Québec (B.N.Q.) (dernière édition).
 - .1 NQ 2501-255 : Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN.m/m3).
 - .2 NQ 2560-114 : Travaux de génie civil-Granulats

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 aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Provide Departmental Representative with access to source and processed material for sampling.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

Part 2 Products

2.1 MATERIALS

- .1 Foundation materials: MG 20 type materials meeting the requirements of NQ 2560-114 « Travaux de génie civil – Granulats », after complete implementation and compaction of materials.
- .2 Foundation materials: MG 112 materials meeting the requirements of NQ 2560-114 « Travaux de génie civil – Granulats », after complete implementation and compaction of materials.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 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 Departmental Representative 4 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.

Part 3 Execution

3.1 PREPARATION

- .1 Topsoil stripping:
 - .1 Evacuate topsoil off site.
- .2 Processing:
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .3 Stockpiling:
 - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
 - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
 - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
 - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
 - .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Maximum 1.5 m for coarse aggregate and base course materials.
 - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
 - .3 Maximum 1.5 m for other materials.
 - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
 - .9 Do not cone piles or spill material over edges of piles.
 - .10 Do not use conveying stackers.
 - .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

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.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Approved: 2012-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33 - excavating, trenching and backfilling.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
- .2 Ministry of Transport of Quebec
 - .1 CCDG – cahier des charges et devis généraux du ministère des transport du Québec (dernière édition).
- .3 Underwriters Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 EXISTING CONDITIONS

- .1 Examine subsurface investigation report which is attached at the end of this document.
- .2 Known underground and surface utility lines and buried objects are as indicated on site plan.
- .3 Refer to dewatering in Section 31 23 33 - Excavating, Trenching and Backfilling.

Part 2 Products

2.1 MATERIALS

- .1 Fill material according to 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

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 rough grading 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 STRIPPING OF TOPSOIL

- .1 Remove topsoil and other organic matter from the entire surface of the lot.
- .2 Evacuate topsoil to an appropriate waste site and in accordance with MELCC's Soil Protection and Contaminated Sites Policy.

3.3 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 At the time of rough leveling, give the ground a slope according to the indications in the plan of leveling in architecture of the landscape.
- .3 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

- .4 Compact filled and disturbed areas to corrected maximum dry density to ASTM D698, as follows:

- .1 95 % under paved and walk areas.

3.4 TESTING

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by Departmental Representative. In accordance with 01 29 83 - Payment Procedures for Testing Laboratory Services and 01 45 00 - Quality Control.

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.

3.6 PROTECTION

- .1 Protect and/or transplant existing, landscaping, buildings, surface or underground utility lines and benchmarks which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads.
- .3 Special attention to the work near the structure of the ville-marie tunnel located under the right-of-way.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specification sections.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-13, Standard Test Method for Materials Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557/12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - .6 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium.
 - .2 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of test and Standard Practices for concrete.

- .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A300-08, Cementitious materials compendium.
 - .2 Concrete: Constituents and Construction Work / Test Methods and Standard Practices for Concrete
- .5 National Research Council Canada (NRC) and the Régie du Bâtiment du Québec.
 - .1 Québec Construction Code – Chapter 1, Building and National Building Code of Canada 2005 (amended) as well as the user's guide – NBC 2005: Structural Commentaries (Part 4 of Division B)
- .6 Bureau de normalisation du Québec (BNQ) (Dernière édition) :
 - .1 BNQ 1809-300 : Travaux de construction - Clauses techniques générales - Conduites d'eau potable et d'égout
 - .2 NQ 2501-255 : Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN.m/m³).
- .7 Ministère des Transports du Québec :
 - .1 Cahier des charges et devis généraux du Québec - Infrastructures routières, Construction et réparation (Dernière édition).
 - .2 Cahiers des Normes, Ouvrages Routiers, Tome VII « Matériaux » (Dernières éditions).

1.3 DEFINITIONS

- .1 Type of excavation:
 - .1 Regular excavation:

Digging out of all excavation materials of any type whatsoever not considered to be rock, including erratic dense land, compact clay, frozen and partially cemented materials, and existing foundations and roads that can be removed with heavy construction equipment.

.2 Rock removal:

Igneous, sedimentary or metamorphic rock, which before being excavated was part of solid rock, and stones or rock fragments whose individual volume exceeds 1 m³.

.2 Topsoil:

- .1 all material suitable for plant growth which may be used as supplementary soil for landscaping or seeding.
- .2 Any material reasonably free from subsoil materials, clumps of clay, brush, weeds and other debris, and free of pebbles, stumps, roots and other harmful materials. 25 mm (1 inch).

.3 Waste materials: surplus materials or excavated materials that cannot be used for this project.

.4 Borrowed materials: materials from areas located outside the areas to be backfilled, required for backfilling or other parts of the work.

.5 Unsuitable materials:

.1 Weak, compressible materials located beneath excavated areas.

.2 Frost-prone materials located beneath excavated areas.

.3 Frost-prone materials:

- .1 Fine-grained soil with a plasticity index of less than 10, according to the ASTM D4318 test, and sizing that complies with the specified limits of the ASTM C136 and ASTM D422 tests. Sieve slot sizes shall comply with the CAN/CGSB-8.1 and CAN/CGSB-8.2 standard.

.2 Table

Sieve Slot Sizes	% of Sieved Material
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

- .3 Coarse-grained soil of which more than 20% by weight passes through a 0.075 mm sieve.

.6 Undisturbed Soils: Soils whose geotechnical properties have not been altered by previous interventions on the site or by the Contractor's work.

- .7 Dimensionally stabilized fill materials (concrete fill): very weak mix composed of Portland cement, concrete aggregate and water that will not compact once placed in utility service mains, and which can be excavated without prior preparation.

1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to the start of excavation work, the Contractor shall submit to the Departmental Representative, for verification and approval details of dewatering and heave protection methods as required before undertaking the work.
- .3 At least two (2) weeks prior to the start of the work, notify the Departmental Representative of the proposed suppliers of aggregates and fill materials and allow access for sampling purposes.
- .4 Submit to a testing laboratory, for analysis, 25 kg samples of each type of backfill material prescribed as well as samples of the types of excavated materials for granulometric analysis and Proctor test. In the case of large gravel or pieces of stone, submit 70 kg samples. No backfilling is to be carried out prior to the approval of materials by the laboratory.
- .5 Furthermore, at the request of the Departmental Representative, tests may be conducted on materials required on site, to ensure they are consistent with samples submitted to the laboratory.
- .6 Any non-compliant material shall be replaced by materials approved by the Departmental Representative and the work shall be redone at the Contractor's expense.
- .7 Provide the Departmental Representative with a laboratory analysis confirming that the aggregates to be used as fill do not contain pyrite.

1.5 EXCAVATION SLOPES, BRACING, CROSS BRIDGING, SUPPORT STRUCTURES AND UNDERPINNING WORK

- .1 Prevent the excavation walls from collapsing or sloughing. Prevent the shifting or compacting of adjacent and excavation soil, as well as soil adjacent to existing buildings, facilities and services or adjacent to buildings, facilities and services under construction.
- .2 During excavation work, construct the required slopes and/or provide and place all the falsework, cofferdams, bracing or other supports needed for proper excavation. The Contractor shall be entirely responsible for all this work.
- .3 Follow the recommendations of the geotechnical study attached hereto and comply with the Safety Code for the construction industry and local by-laws when determining slope angles and designing earth retention systems.

- .4 If support structures are required on the Departmental Representative's drawings: design, provide and install walls at these locations. Also, design, provide and install the other additional walls or bracing required according to the excavation method selected by the Contractor.
- .5 The specialized Contractor is entirely responsible for engineering and designing earth retaining structures. The structures shall be designed to withstand the pressure exerted by the soil, water, overloads caused by the foundations or buildings adjacent to the work, highway overloads and overloads exerted by the machinery needed to construct the basin. In addition, their design shall comply with the Quebec Construction Code - Chapter I, Building and National Building Code of Canada 2015 (amended), in particular parts 4 and 8, as well as the supplement to the National Building Code of Canada 2015.
- .6 The support structures required near main water supply lines shall be constructed using bored piles (see drawings and geotechnical study). No pile driving work shall be allowed near these lines.
- .7 The Contractor shall confirm the location of these main supply lines by carefully excavating the ground to locate them.
- .8 All costs for the support structures and excavation required to locate utilities shall be included in the submission costs.
- .9 The Contractor is solely responsible for damage to persons or existing buildings, installations and services that may result from the absence or weakness of support structures or cofferdams, or due to the use of incorrect slope angles, whether this damage is the result of their incorrect installation, poor maintenance or removal.
- .10 When a demolition or partial dismantling of the retaining structures is required, the Contractor must ensure that the work is carried out in accordance with applicable standards and local regulations.
- .11 Include the cost of all work required to protect the excavations in the submission price.
- .12 In cold weather, protect the slopes from frost so that backfilling operations can continue without interruption.
- .13 Retain the services of an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec to design and inspect the retaining walls, cofferdams, sheet piles, as well as the support, cross bridging and underpinning structures required for the work, or to determine the required slope angle for excavation walls to ensure their stability in compliance with the most recent version of the Canadian Code for Construction Safety, and local by-laws.
- .14 At least 2 weeks before the start of the work, submit the design documents and related technical data for verification. All documents shall be submitted in triplicate. A single (1) annotated electronic copy shall be returned to the Contractor. One (1) annotated electronic copy will be returned to the Contractor.

- .15 Design documents and related technical data shall bear the seal and signature of an Engineer recognized in the Province of Quebec.
- .16 The Engineer responsible for designing the falsework and slope angles shall provide proof that he has a professional liability insurance policy, unless this Engineer is employed by the Contractor. If so, the Contractor shall provide proof that his insurance policy covers his engineer's work.
- .17 The excavation area shall not exceed the property lines and/or permanent easements and/or construction easements.
- .18 Take into account the recommendations of the geotechnical study on the thrusts to consider when designing the planned support systems.

1.6 PROTECTION OF EXISTING STRUCTURES

- .1 Protect the excavation bottoms against any softening. If softening occurs, remove the softened soil and replace it with type 2 compacted fill.
- .2 Protect excavation bottoms against frost.
- .3 Take the necessary measures to eliminate the dust generated.
- .4 Adequately protect existing facilities, buildings and services, and existing equipment located on site to ensure they are not damaged during the work.
- .5 Never stack waste material in an area where it could hinder the work or property drainage.
- .6 Underground structures and utility systems
 - .1 Before starting to dig trenches, determine the location and condition of the underground structures and systems.
 - .2 Details indicated on the drawings regarding the dimensions, location and depth at which underground structures and utilities are buried are only provided for general information purposes and are not necessarily accurate or complete.
 - .3 Prior to starting trenching, notify Departmental Representative and/or authorities of applicable utility companies and determine location and condition of underground works and networks. Clearly mark locations to avoid any interruption of service during the execution of the work.
 - .4 Confirm the location of the underground systems by carefully performing trial excavations.
 - .5 Maintain in operation and protect against any damage all water, sewage, gas, electricity and telephone lines as well as other systems or structures that might be in the areas to be

excavated. Before moving or disturbing a structure or a public utility system in any way, obtain appropriate directives from the Departmental Representative.

- .6 If required, provide the Departmental Representative and the public company with recommendations regarding the removal or detour of existing systems at the excavation site. Assume the costs for this work.
- .7 Take note of the location of the underground lines that have been retained, diverted or abandoned.
- .8 Confirm the location of excavations recently performed near the work area.
- .7 Existing buildings and structures on the property
 - .1 In the presence of the Departmental Representative, check the condition of the buildings, trees and other plants, lawns, fences, service poles, cables, railroad tracks, road surfaces, survey markers and elevation indicators that need to stay in place and which may be damaged during the work.
 - .2 Protect existing buildings and structures on the property likely to sustain damage, against all such damage while the work is being performed. In the event of damage, immediately restore the affected components to their original state, to the Departmental Representative's satisfaction.
 - .3 If roots or branches need to be cut to complete the excavation work, only perform this work after obtaining the Departmental Representative's approval.
- .8 Comply with municipal requirements and the Safety Code for the construction industry, S-2.1, r.4, Province of Quebec, regarding excavation and worker protection safety standards.
- .9 Adequately protect elevation indicators, alignment markers, survey markers and geodetic monuments located on the construction site.
- .10 Take all necessary measures to prevent any property damage and bodily injury.
- .11 Install protective barriers around all excavation sites.

1.7 SUBSOIL CONDITIONS

- .1 The report Étude géotechnique et caractérisation environnementale des sols prepared by Stantec on July 18th 2018 under file number 159100531.204 is attached to the contract documents.
- .2 Read and understand this report to determine the type, status and scope of the excavation work to be performed.

1.8 CHOICE OF EXCAVATION METHODS

- .1 The Contractor is solely responsible for choosing the excavation methods to be applied. Submit these methods beforehand to the Departmental Representative for review and comments.

1.9 BLASTING OPERATIONS

- .1 No blasting shall be permitted during the work.

PART 2 - PRODUCT

2.1 Materials

.1 Type 1 fill: crushed stone 20-0

Clean, hard, durable crushed stone or gravel free of shale, clay and friable, organic or deleterious material; the sizing of the material shall remain within the range indicated below, when tested in accordance with the ASTM C136 and ASTM C117 standards, and the sizing curve plotted on a semi-logarithmic graph shall be continuous and progressive. The fill shall be certified DB 0-20 fill.

ASTM Sizing; % Throughs

31.5	mm	100
20	mm	90-00
14	mm	68-93
5	mm	35-60
1.25	mm	19-38
315	µm	9-7
80	µm	2-7

.2 Type 2 fill: granular Class A soils:

Compactable soils, essentially comprising granular, hard, durable, non-plastic material, MG-112 granular as NQ 2560-114, gravel or crushed stone. These soils shall be free of shale, clay, and friable, organic or deleterious material, and of contaminated material. These soils shall not be frost prone. These soils shall not contain rubble greater than 112 mm in diameter.

.3 Drainage fill:

- .1 Crushed stone 19 mm in diameter, clean, hard and durable, containing no dust or foreign material, organic or plant material, or flat or elongated fragments.

- .2 Crushed stone type BC 5-20, durable, free of dust, foreign matter, organic or vegetable matter and flat or elongated fragments, in accordance with NQ 2560-114.

.4 Dimensionally stabilized fill materials (unshrinkable fill):

- .1 0.4 MPa maximum compression strength at 28 days;
- .2 maximum Portland cement content of 25 kg/m³, in accordance with the CAN/CSA-A3000, Type GU standard;
- .3 0.07 MPa minimum strength at 24 hours;
- .4 concrete aggregate: in accordance with the CAN/CSA-A23.1/A23.2 standard;
- .5 Portland cement: type GU:
- .6 slump: 160 to 200 mm.

.5 Anti-shear reinforcement:

Biodegradable corrugated cardboard, 100 mm thick, treated to support cast-in-place concrete adequately until it has hardened.

.6 Rigid styrofoam insulation:

The insulation must have the following characteristics:

- Compressive strength: 415 kpa min, according to ASTM D1621.
- Water absorption: 0,7%, 96h of immersion, according to ASTM D2842.
- Linear thermal expansion coefficient: 6.3×10^{-2} mm/m °C, according to ASTM D696.
- Flexural strength: 585 kpa, according to ASTM C203.
- Compression module: 15.170 kpa, according to ASTM D1621.
- In accordance with CAN S701, Type4.

- .7 Before using, have the Departmental Representative approve all fill materials. After receiving approval, always purchase the same materials from the same sources.

- .8 Provide supplementary fill material suitable for the work, from an outside supplier.

PART 3 - EXECUTION

3.1 PREPARATORY WORK

- .1 At the start of the work, clear away all obstacles, snow and ice from the surfaces of the excavation and backfill area to the extent indicated and/or required to perform the work.
- .2 Using a saw, carefully cut the surfaces of the roads and sidewalks along the perimeter of the proposed excavation so the surfaces break cleanly and uniformly.
- .3 The Contractor shall construct a work surface made of granular material to enable heavy machinery to travel to the work site.

3.2 PREPARATION/PROTECTION

- .1 Keep excavations clean, free from standing water and loose soil.
- .2 Where soil can vary significantly in volume due to fluctuations in moisture content, cover and protect to the satisfaction of the Departmental Representative.
- .3 Protect natural and artificial elements that must remain in place. Unless otherwise indicated or unless located in a building area, protect existing trees from damage.
- .4 Protect utility lines that must remain in place.

3.3 COFFERDAM, STRETCHING, GRIEVING AND RECOVERY UNDER WORK

- .1 Protect the walls of excavations by appropriate methods and in accordance with the Health and Safety Act of the Province of Quebec.
- .2 Construct temporary structures at depth, height and locations approved by Departmental Representative.
- .3 Perform the following operations during backfilling:
 - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheet piles and shoring works from excavations.
 - .2 Do not remove braces until fill material has been stacked to their height.
 - .3 Remove sheet piles gradually so as to maintain compacted backfill at least [500] mm above their lower ends.
 - .4 Unshrinkable fill to be installed under existing public utilities.

3.4 EXCAVATION DEWATERING AND UPLIFT PREVENTION

- .1 Keep the excavations dry throughout the work.
- .2 Submit to the Departmental Representative for [approval], the details of the proposed methods for dewatering the excavations or preventing uplift, such as the installation of dikes and filtration points, and sheet pile cut off.
- .3 Protect open pits against flooding and damage that may result from surface runoff.
- .4 Take the required measures to prevent heaving and to ensure the bottoms of deep excavations remain stable. Have an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec design the pumping method and establish the anticipated flows and the number of pumps required to achieve this objective. Submit a drawing of the method along with calculations to the Departmental Representative for review and comments, before the work begins.
- .5 Maintain pumping operations throughout the entire construction process to ensure the stability of the structures and to prevent them from uplift.
- .6 The Contractor is solely responsible for controlling groundwater as well as ensuring the stability of the structures and preventing them from uplift during construction.

3.5 EXCAVATION

- .1 Notify the Departmental Representative at least one week before starting the excavations and record the elevations of the natural land in his presence where necessary.
- .2 Perform the excavation work according to the indicated mapping, profiles, levels, cuts and dimensions to enable the installation, construction, inspection and drainage of the required structures.
- .3 During the excavation work, remove concrete structures, masonry, parking lot and access surfaces, sidewalks, demolished foundations and rubble as well as any obstructions.
- .4 Excavate according to specific lines and levels to minimize the quantity of fill required.
- .5 The excavation work shall in no way alter the load-bearing capacity of adjacent foundations.
- .6 Do not move the earth under the canopy of trees or bushes that are to remain in place. If it is necessary to excavate between the roots, excavate by hand and cut the roots with a well-sharpened axe or saw.
- .7 Excavation materials and piled materials shall be stored at an adequate distance from the trenches.
- .8 Limit work performed with construction machinery in the immediate vicinity of unfilled trenches.

- .9 Permanently dewater all construction site areas during the work, as required under Section 3.7 of these specifications.
- .10 Remove all unsuitable material, stone or rock fragments from the excavation site or material that might slide down into it.
- .11 Excavation bottoms shall be free of loose, soft or organic material.
- .12 If the soil at the bottom of the excavations appears to be unsuitable, notify the Departmental Representative and follow his directives.
- .13 Once the excavations are completed in an area, have them approved by the Departmental Representative.
- .14 When the excavation has gone too deep, backfill the unauthorized excavation with type 2 fill material, installing it as required under Section 3.11 – Backfilling.
- .15 Contour the excavations by hand, reinforce the walls and remove all loose material and debris from the excavations. If the material at the bottom of the excavation has been disturbed, compact it until it is at least as dense as the undisturbed soil. Clean cracks found in the rock and fill them with concrete grout or mortar to the Departmental Representative's satisfaction.

3.6 REMOVAL OF EXCAVATED MATERIALS

- .1 All the excavated materials must be transported off site, in compliance with all the applicable laws.
- .2 When disposing of excavation materials off-site, the Contractor shall provide the additional characterization tests required by the site at its expense. The only tests provided by the Owner are those provided by the environmental soil survey attached to the contract documents.
- .3 The Contractor shall load, transport and dispose of all waste materials outside the boundaries of the site, in an appropriate disposal site chosen by him and in accordance with the guidelines of the Soil Protection and Rehabilitation Policy for contaminated lands of the MELCC.
- .4 Materials resulting from deforestation and cleaning of the area affected by the work (such as trees, shrubs, branches, brush, stumps, dead wood, other plant debris and materials containing demolition debris) or demolition of existing pavement, curbs, sidewalks or underground facilities must be disposed of in an authorized site for dry materials.
- .5 Excavation materials from granular foundations may not be reused as backfill material in the building and at the outer perimeter of the foundations. The Contractor must plan his backfilling work using new backfill material.

- .6 All the work of the preceding provisions shall be carried out in accordance with the Directives and / or Regulations of the Soil Protection and Contaminated Sites Rehabilitation Policy of the MELCC which, in case of contradiction, have priority over the previous requirements

3.7 **FILL AND COMPACTING MATERIALS**

- .1 No excavation material can be reused for backfilling.
- .2 Densities achieved by compacting are percentages of calculated maximum densities based on the ASTM D698 and ASTM D1557 standards.
- .3 Use backfill materials that comply with the types defined in Section 2.1.
- .4 The specifications shown on the Departmental Representative's drawings for the various layers of fill material are minimum backfill specifications after compacting.
- .5 Backfill the area around completed structures to the levels indicated on the drawings, with the various layers of fill material specified thereon.
- .6 Unless otherwise indicated on the drawings, compact the various materials to achieve the densities indicated below:
- .1 type 1: 95% Modified Proctor
- .2 type 2: 95% Modified Proctor
- .7 Use Type 1 or 2 soil for backfill 1m at the outer perimeter of the building foundations.
- .8 Take care not to damage membranes, wall and slab insulation during backfill operations.
- .9 Unless otherwise indicated, install the backfill material in uniform horizontal layers not exceeding 300 mm in compacted thickness to the specified levels. Compact each layer before placing the next layer.
- .10 During the work, if tests indicate that the materials do not comply with the requirements described in these specifications, remove and replace the unacceptable materials at no additional cost and resume work.
- .11 After the backfill work is completed, rough grade the entire property to the levels and slopes required to ensure surface water runs away from the building and the topsoil and sod can be placed in accordance with the required slopes and levels.
- .12 Install the Rigid styrofoam insulations as indicated on the civil plan C02.

3.8 BACKFILLING

- .1 Backfill the area along the walls only after construction of structural slabs and concrete has reached specified compressive strength.
- .2 Do not start backfilling before completion of the drainage, waterproofing and insulation work, and before the Departmental Representative has inspected the site and given his authorization.
- .3 The surfaces to be backfilled shall be free of debris, snow, ice, water or frozen earth. The backfill shall not contain any frozen material, ice, snow or debris.
- .4 Place the backfill material around the structures in compliance with the specifications of paragraph 3.8 of this section and the Departmental Representative's directives.
- .5 Do not place backfill material around or above cast-in-place concrete structures within 24 hours of removing the forms from the concrete.
- .6 Simultaneously backfill each side of walls or other structural component to ensure the stresses exerted by the soil cancel one another out. The difference in backfill height shall not exceed 500 mm.
- .7 When the earth is likely to exert uneven pressure temporarily on walls or other structures:
 - .1 allow the concrete to cure for at least 28 days and wait until it is strong enough to support the pressure exerted by backfilling and compacting, and until it is approved by the Departmental Representative.
 - .2 if the Departmental Representative gives his approval, install supports or cross bridging to neutralize the uneven pressure and leave them in place until the Departmental Representative authorizes their removal.
- .8 Unless otherwise indicated by the Departmental Representative, remove the falsework from the excavations as backfilling progresses.
- .9 During backfilling:
 - .1 Do not remove the cross bridging before the fill material has reached the levels at which the cross bridging has been installed;
 - .2 Remove the sheet piles, as to keep the compacted backfill at least 500 mm above the bottom of the sheet piles.
- .10 Spread the backfill material in uniform horizontal layers not exceeding 150 mm in compacted thickness to the specified levels. Compact each layer before spreading the next layer.
- .11 Carry out dimensionally stabilized backfills at the specified locations.

- .12 Consolidate and level these dimensionally stabilized backfills using internal vibrators.

3.9 INSPECTION AND TRIALS

- .1 The materials and compacting analyses shall be performed by a testing laboratory designated and paid for by the Owner.

3.10 FROST PROTECTION

- .1 When backfilling is performed under freezing conditions, defrost and heat the material before placing and compacting it. Protect the ground against frost until the backfilling operation is completed.

3.11 SITE RESTORATION

- .1 Once the work is completed, remove any surplus material and debris, re-grade the slopes and correct any defects identified by the Departmental Representative.
- .2 Re-install the topsoil according to the Departmental Representative's directives.
- .3 Re-install the sod to its pre-excavation level.
- .4 Restore the surfaces of roads and sidewalks affected during the work to the condition and level that existed before the excavation began, ensuring that these structures are restored to their original thickness.
- .5 Clean and restore areas damaged during the work, according to the Departmental Representative's directives.
- .6 During the first 24 hours, use temporary shoring to support the loads exerted by traffic on the dimensionally stabilized backfills.
- .7 Protect newly graded areas from erosion, prevent traffic and keep them free of waste or debris.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33 - excavating, trenching and backfilling.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM D4491-99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .3 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .4 ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .5 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3 CSA Group
 - .1 CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIAL

Geotextile: non-woven synthetic fibre fabric, supplied in rolls. Composed of a minimum 70% of polypropylene with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure.

- .1 Physical properties:
 - .1 Thickness: to CAN/CGSB-148.1, No.3.
 - .2 Mass per unit area: to CAN/CGSB-148.1, No.2
 - .3 Grab tensile strength and elongation: to CAN/CGSB-148.1, No.7.3.
 - .1 Breaking force: minimum 800N
 - .2 Elongation at future: maximum 105 %.
 - .4 Ball burst strength: to CAN/CGSB-4.2, No.11.2, minimum 2275 kpa
- .2 Hydraulic properties:
 - .1 Permittivity: 0.96 S^{-1} to CAN/CGSB-148.1, No.4.
- .3 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to A123M.
- .4 Factory seams: sewn in accordance with manufacturer's recommendations.
- .5 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

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 geotextile material 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 Departmental Representative.

3.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with.
- .2 Do not set up geotextiles if the soil is flooded with water.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 300 mm over previously laid strip.
- .5 Pin successive strips of geotextile with securing pins.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 After installation, cover with overlying layer within 4 hours of placement.
- .8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .9 Place and compact soil layers in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

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.

3.4 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.
- .2 Do not overload soil or aggregate covering on geotextile.

END OF SECTION

DIVISION 32

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 - Aggregates for earthwork

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .6 ASTM D1557-09, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
 - .7 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .8 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Bureau de normalisation du Québec (B.N.Q.) (Last edition).
 - .1 NQ 2501-255 : Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN.m/m³).
 - .2 NQ 2560-114 : Travaux de génie civil-Granulats.
- .4 Ministry of Transport of Quebec:
 - .1 Cahier des charges et devis généraux du Ministère des Transports du Québec, dernière édition.
 - .1 Section 13 - Revêtement de chaussée en enrobé.
 - .2 Cahiers des Normes, Ouvrages Routiers, Tome I « Conception routière », dernière édition.
 - .3 Cahiers des Normes, Ouvrages Routiers, Tome VII « Matériaux », dernière édition.
 - .1 Norme 2101 - Granulats.

- .2 Norme 2102 - Matériaux granulaires pour fondation, sous-fondation, couche de roulement granulaire et accotement.
- .3 Norme 13101 - Géotextiles

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit 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 with manufacturer's written instructions.
- .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Granular sub-base material: in accordance with Section 31 05 16 - for earthwork.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base 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 PLACING

- .1 Set up the geotextile membrane on the pavement infrastructure with 300mm membrane overlaps.
- .2 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.
- .3 Construct granular sub-base to depth and grade in areas indicated.
- .4 Ensure no frozen material is placed.
- .5 Place material only on clean unfrozen surface, free from snow or ice.
- .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.

- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .1 Consultant Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .10 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 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.
- .3 Compact to density of not less than 95 % corrected maximum dry density.
- .4 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .5 Apply water as necessary during compaction to obtain specified density.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

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 SITE TOLERANCES

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.6 PROTECTION

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 11 16.01 – Granular sub-base

1.2 PRICE AND PAYMENT PROCEDURES

- .1 See Section 01 29 00 - Payment

1.3 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C136-13, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Colored Concrete.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
 - .3 LEED Canada 2009 for Design and Construction-2010, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.
 - .4 LEED Canada for Existing Buildings, Operations and Maintenance 2009, LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.
- .3 CSA Group
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-A179-04 (R2009), Mortar and Grout for Unit Masonry.
 - .3 CSA A231.1/A231.2-06 (R2010), Precast Concrete Paving Slabs/Precast Concrete Pavers.
 - .4 CSA A283-06 R2011), Qualification Code for Concrete Testing Laboratories.

1.4 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 precast concrete unit paving. Product data to include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings
 - .1 Indicate on drawings layout, pattern and relationship of paving joints to fixtures and project formed details.
- .4 Samples
 - .1 Submit full size sample of each type paver.
- .5 Test and Evaluation Reports
 - .1 Submit following sampling and testing data:
 - .1 Sieve analysis for gradation of bedding and joint material.
 - .2 Unit paver sampling and testing.
 - .3 Evaluation of cleaning and [sealing compound.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - .3 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Sustainable Design Submittals
 - .1 LEED Canada Submittals: N/A
 - .2 Construction Waste Management
 - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
 - .3 Recycled Content
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products. Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-industrial content, and total cost of materials for project.
 - .4 Regional Materials: submit evidence that project incorporates required percentage

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in precast concrete paver installations approved by manufacturer with documented experience.
- .2 Mock-ups

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct 2.4 x 2.4 m area mock-up.
- .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .2 To determine surcharge of bedding layer, joint sizes, lines, laying pattern and texture.
 - .3 For testing to determine compliance with performance requirements.
 - .4 Perform the following tests: Locate where directed.
 - .5 Allow 24 hours for inspection of mock-up before proceeding with work.
 - .6 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Mock-up may remain as part of the finished work.

1.6 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 in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect precast concrete units from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse of pallets as specified in Waste Reduction Workplan, in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 CONCRETE PAVERS

- .1 Concrete pavers: to CSA A23.1/A23.2 and as follows:
 - .1 Dimensions: 600mmX600mmX100mm, 300mmX600mmX100mm
 - .2 Shapes: square and rectangular as per the installation diagram on the plan
 - .3 Colour: granite grey with ground textured finish (Grenart) according to the arrangement on the plan.
 - .4 Standard end, corner, border units as required.
 - .5 In order to avoid pavers cuts, the followings formats should also be used :
 - .1 Dimensions: 300mmX600mmX100mm et 300mmX300mmX100mm
 - .2 Shapes: square and rectangular as per the installation diagram on the plan

- .3 Colour: granite grey with ground textured finish (Grenart) according to the arrangement on the plan.
- .2 Manufactured in moulds, with spacers, suitable for installation and delivered on site in cubes of laying panels, in protective wrapping.
- .3 Pigment in concrete pavers: to ASTM C979/C979M.

2.2 **BEDDING AND JOINT MATERIAL**

- .1 Determine bedding sand hardness as follows:
 - .1 Randomly select single [1.4] kg sample from sand source.
 - .2 Dry sample for 24 hours at 115 degrees C to 121 degrees C.
 - .3 Obtain 3 sub-samples each weighing 0.2 kg by passing original sample several times through riffle box.
 - .4 Carry out sieve analysis test on each sub-sample in accordance with CSA A23.1/A23.2.
- .2 Remix each sub-sample and place in nominal litre capacity porcelain jar with two 25 mm diameter steel ball bearings weighing 75 +/-5 g each. Rotate each jar at 50 rpm for six [6] hours. Repeat sieve analysis. Record individual and average sieve analysis.
- .3 For each sample tested, maximum increase in percentages passing each sieve and maximum individual percent passing is in accordance with table as follows:

Sieve Size	Maximum Increase	Maximum Passing
0.075 mm	2%	2%
0.150 mm	5%	15%
0.300 mm	5%	35%

- .4 Bedding and joint sand: clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock or gravel. Do not use limestone screenings or stone dust.
- .5 Gradation: to CSA A23.1/A23.2, Table 4 - Grading Limits for Fine Aggregate, and CAN/CSA-A179 as follows:

Sieve Size	% Passing for Bedding Sand	Joint Sand
10 mm	100	
5 mm	95 -100	100
2.5 mm	80 – 100	95 – 100
1.25 mm	50 – 90	60 – 100
630 microns	25 – 65	
600 microns		35 – 80
315 microns	10 – 35	
300 microns		15 – 20
160 microns	2 - 10	
150 microns		2 - 15

2.3 **EDGE RESTRAINTS**

- 1. Edging for pavements 100 mm thick: Industrial Type PVC border designed for pedestrian, vehicular and commercial applications with rear support.

1. L-shaped with triangular reinforcement section.
2. L-shape dimensions: 17, 93mm wide x 17, 93mm height x 2, 54mm thick.
3. Dimension of the triangular reinforcing section: 50, 80mm wide x 25, 40mm high x 50.80 mm at angle x 2, 54mm thick.
4. Pre-drilled perforated holes at all 304, 80mm for galvanized steel nails of 9, 53mm diameter.
5. The contractor must install the 254 mm long galvanized steel nails supplied by the manufacturer to pre-drilled perforated holes.

2.4 CLEANING COMPOUND

- .1 Clear, organic solvent, designed and recommended by manufacturer for cleaning concrete pavers of contamination encountered.
- .2 Acid based chemical detergent, designed and recommended by manufacturer for removal of contamination encountered on pavers.

2.5 SEALING COMPOUND

- .1 Clear, exterior type, water based, specially formulated for application on precast concrete pavers.
- .2 Clear, exterior type, specially formulated for application on precast concrete pavers.

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 precast concrete unit paving installation in accordance with manufacturer s written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform the 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 STRUCTURAL SURFACE

- .1 Verify that structural surfaces conform to section 32 11 16.01 – Granular sub-base and levels and compaction required for installation of unit pavers. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Verify that top of structural surface (top of base) does not exceed plus or minus 10 mm of grade over 3 m straightedge.
- .3 Ensure that structural surface is not frozen or standing water is present during installation.

3.3 INSTALLATION OF EDGE RESTRAINTS

- .1 Install restraints true to grade, in accordance with manufacturer's recommendations.
- .2 Execute perfectly straight or perfectly curved lines in according with the instructions given on the installation plan.
- .3 Secure the edge restraints with the metal spikes supplied with the edge restraints by the distributor. Place one stake every 300 mm centre-to-centre.

3.4 PLACING OF BEDDING MATERIAL

- .1 Ensure bedding material is not saturated or frozen at all times until installation is complete.
- .2 Spread and screed material on structural surface to achieve 20 mm compacted thickness after vibrating pavers in place. Do not use joint sand for bedding sand.
- .3 Do not disturb screeded material. Do not use bedding material to fill depressions in structural surface.

3.5 INSTALLATION OF CONCRETE PAVERS

- .1 Lay pavers to pattern[s] indicated. Joints between pavers: 3 to 5 mm wide.
- .2 Use appropriate end, edge and corner stones. Saw cut pavers to fit around obstructions and at abutting structures. Reproduce the original chamfer using a suitable tool.
- .3 Installation by mechanical equipment:
 - .1 Prepare installation sequence and obtain approval of sequence by Departmental Representative.
 - .2 Place paver pallets and other materials without exceeding load bearing capacity, or otherwise detrimentally affecting installations.
 - .3 Run equipment approved for installation only on paving surfaces vibrated in place.
 - .4 Complete installation after placing each 5 m width of installation.
 - .5 Inspect pavers and remove chipped, broken or otherwise damaged pavers if structural performance or aesthetics is adversely compromised, as directed by Departmental Representative.
 - .6 Replace pavers removed without altering layout and structural quality.
- .4 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding sand.
- .5 Inspect, remove, and replace chipped, broken and damaged pavers.
- .6 Sweep dry joint sand material into joints.
- .7 Settle sand by vibrating pavers with plate compactor.
- .8 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.
- .9 Complete installation to within 1 m of laying face, with sand-filled joints, at completion of each work day.

- .10 Sweep off excess joint material when installation is complete.
- .11 Proof roll street pavements with at least two passes of a 10 T rubber-tired roller.
- .12 Final surface elevations not to exceed plus or minus 10 mm under 3 m long straightedge.
- .13 Surface elevation of pavers: 2 to 3 mm above adjacent catch basins, drainage inlets, concrete collars or channels.
- .14 Ensure conformance of final elevations.

3.6 PRECAST CONCRETE UNIT CLEANING

- .1 Carry out cleaning at times and conditions recommended by manufacturer of cleaning compound, immediately prior to sealing and as directed by Departmental Representative.
- .2 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.
- .3 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer s recommendations.
- .4 Final surface to be free of contamination.

3.7 SEALING

- .1 Ensure paver surfaces to be sealed are clean, free of extraneous materials and efflorescence, dry and appropriately cured.
- .2 Apply two coats of sealant, each in accordance with manufacturer's recommendations.
- .3 Protect sealed surfaces from trespass until sealer has dried and hardened.

3.8 FIELD QUALITY CONTROL

- .1 Retain concrete testing laboratory accredited in accordance with CSA A283.
- .2 Sample and test in accordance CSA A23.1/A23.2.
- .3 Do sampling and testing once for each 200 square metres of material on site, as directed by Departmental Representative.
- .4 Departmental Representative will select 10 pavers for testing from material on site for each sampling.
- .5 Submit test results to Departmental Representative for approval of precast concrete pavers.

3.9 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 10 – 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal fabrications;
- .2 Section 32 91 19.13 - Topsoil Placement and Grading;
- .3 Section 32 93 10 Plantings of Trees, Shrubs and Ground Cover.

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
 - .2 ASTM A269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-92, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(C1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16.1-01, Limit States Design of Steel Structures.
 - .4 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (prepared in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-M1989(R2001), Welded Steel Construction, (Metal Arc Welding) [Metric].

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications, instructions and data sheets for furniture. Product data to include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Submit shop drawings indicating dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

- .1 Sustainable Standards Certification:
 - .1 Certified Wood: Provide listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

1.6 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 equipment and materials off ground in a clean, dry, well-ventilated area in accordance with manufacturer's recommendations.
 - .2 Store and protect furnishings from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.7 WARRANTY

- .1 The manufacturers must provide a written warranty for the furnishings and equipment supplied, for a period of at least three (3) years, calculated from the date of provisional acceptance of the work.
- .2 Paint:
 - .1 5-year warranty: Against excessive discoloration of the polyester powder paint due to UV rays.
 - .2 3-year warranty: Against peeling.
- .3 The warranty must include the proper operation and appearance of the pieces of equipment (parts and labour) and the replacement of any defective parts that are included in the present project.
 - .1 The contractor must honour the manufacturer's warranties with regard to the standards and especially on the equipment components.

Part 2 Products

2.1 BENCH

- 1. Metal Structure: Weathering steel frame 5mm of thickness in accordance with the standard CAN/CSA-G 40.20/G 40.21, type 50a/A588 welded and sandblasted with chamfered stop of 1mm. Weathering steel with increased resistance to atmospheric corrosion including a wood anchoring system. Galvanized steel Bench Support and 1/16

neoprene buffer zone. Add a clear lacquer finish to the weathering steel structure of the benches to avoid stains, dirt and drainage.

2. Wood: Wooden slats Douglas-fir coated with a minimum of two coats of exterior dye for natural coloured wood.
- .1 Paint: Polyester-powder paint for weathering-steel-coloured hot-galvanized steel, provide a colour sample for approval. Only the supports and the anchoring system for the wooden slats SHALL BE PAINTED.

2.2 TRASH RECEPTACLES

- .1 Trash receptacle with side ashtray, fully factory-assembled:
 - .1 Supporting frame made of Grade 6061-T6 flat aluminum, 19mm thick x305mm wide, Painted aluminum frame. Finish: Polyester-powder paint, meteor grey.
 - .2 Tip-action container, 70 litres. Inner container made of laser-cut Grade 5052 H32 sheet aluminum, 6mm thick. Lava-coloured container, design 44/60035. Container pivot made of round aluminum tubing 41 dia x 3mm thick, Grade 6061-T6.
 - .3 Side ashtray: laser-cut Grade 5052-H32 aluminum, 3 mm thick. Painted aluminum ashtray. Finish: Polyester-powder paint, meteor grey.
 - .4 Depth of trash receptacle: 400mm
 - .5 Length of trash receptacle: 550mm
 - .6 Height of trash receptacle: 1015mm
 - .7 Weight of trash receptacle: 91kg.
 - .8 See plans and details for anchors, installation and accessories.

2.3 CUBES

1. Metal structure: Weathering steel frame 5mm of thickness in accordance with the standard CAN/CSA-G 40.20/G 40.21, type 50a/A588 welded and sandblasted with chamfered stop of 1mm. Weathering steel with increased resistance to atmospheric corrosion.

2.4 FLAGPOLES

- .1 Conical flagpoles made of anodized aluminum, with the following dimensions: 40' x 7"x 3.5"x .188". .8 See plans and details for anchors, installation and accessories.

2.5 ANCHORS

1. 6, 3mm galvanized steel prefabricated concrete paver anchoring system with threaded holes
2. 6, 3mm x 19mm Stainless steel flat head anti-theft bolts
3. Stainless Steel Safety Washers
4. Stainless Steel Flat Washers
5. Sleeves with internal threads 9, 5mm and mechanical bolts

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 furnishing installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of the Departmental Representative.
 - .2 Inform the Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Commence installation only upon correction of unacceptable conditions and upon approval in writing of Ministerial Representative.

3.2 PREPARATION

- .1 Locate and protect utility lines.
- .2 Notify and acquire written acknowledgement from utility authorities before beginning installation Work

3.3 INSTALLATION

- .1 Assemble furnishings in accordance with manufacturer s written recommendations.
- .2 Install furnishings true, plumb and according to plans.
- .3 Touch-up damaged finishes to approval of Departmental Representative.
- .4 Conform to the maximum embedment of 102mm prescribed in the plans for the furnishing anchors.

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 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.

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 93 10 - Trees, Shrubs and Ground Cover Planting.

1.2 MEASUREMENT FOR PAYMENT

- .1 See Section 01 29 00 - Payment.

1.3 PAYMENT

- .1 See Section 01 29 00 - Payment.

1.4 REFERENCE STANDARDS

- .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment

1.5 DEFINITIONS

- .1 Compost:
 - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
 - .3 Product must be sufficiently decomposed (i.e. stable) so further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminants.
 - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.7 QUALITY ASSURANCE

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by the Departmental Representative.
- .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 TOPSOIL

- .1 Type of soil to be used: Mixture # 2 for planting pits, shrubs, perennials, grasses and annuals.
 1. Two parts of brown earth;
 2. Three parts of black earth;
 3. A part of compost;
 4. A part of coarse sand;
 5. From 10% to 15% organic matter.
- .2 Brown earth: loose soil (brown), with neither too much clay nor too little sand, with an organic content of 4 to 5% for sandy soils and 2 to 3% for clay soils, with a maximum acceptable humus content of 20%. This soil must have a pH of 5.5 to 7.0. This soil also must not contain any subsoil, roots, vegetation, debris, toxic materials, or stones over 50 mm in diameter.
- .3 Black earth (humus): consisting of decomposing materials, fairly supple and homogeneous, free of colloidal residues, wood, sulphur and iron, containing at least 60% organic material by weight and with a maximum water content of 15%. The size of the shredded particles must be less than or equal to 6 mm.
- .4 Planting mixture ;
 - .1 10% to 15% organic material
 - .2 PH: 5.5 to 7.0
 - .3 Capillary space (water): 15 and 25 %
 - .4 Non-capillary space (air): 15 and 30 %
 - .1 Be well screened and provide the following particle-size distribution:

Sieve size	% passing
5 mm	100
2.50 mm	95-100
1.25 mm	72-95
630 µm	35-55
315 µm	8-25
160 µm	5-15
80 µm	0-12

2.2 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 Fertility: major soil nutrients present in following amounts:
 - .2 Nitrogen (N): 20 to 40 micrograms available per gram of topsoil.
 - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .6 Ph value: 6.5 to 8.0.
- .2 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to coarse textured.
- .4 Organic matter: compost Category A, in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .5 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .6 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to the specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

- .1 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.

- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

Part 3 Execution

3.1 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.2 SOIL AMENDMENTS

- .1 If necessary, for planting beds/areas, apply soil amendments and mix thoroughly through entire topsoil layer, as recommended by the Departmental Representative:

3.3 GRADING

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

3.4 ACCEPTANCE

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

3.5 SURPLUS MATERIAL

- .1 Dispose of surplus material off site.

3.6 CLEANING

- .1 Clean in accordance with Section 01 74 11- Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 91 19.13 - Topsoil Placement and Grading.

1.2 REFERENCE STANDARDS

- .1 Agriculture and Agri-Food Canada (AAFC).
 - .1 Plant Hardiness Zones in Canada-2000.
- .2 Canadian Nursery Landscape Association (CNLA)
 - .1 Canadian Standards for Nursery Stock-2006.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .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.
- .5 Bureau de normalisation du Québec (BNQ)
 - .1 NQ 0605-100/2001, Aménagement paysager à l'aide de végétaux [Landscaping with plant material].
 - .2 NQ 0605-400-2001 Produits de pépinières et de gazon [Nursery and lawn products].
 - .3 NQ 0605-400-2001 - Produits de serres [Greenhouse products].

1.3 DEFINITIONS

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis enhances plant establishment in newly landscaped and imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Obtain approval of schedule from Departmental Representative 7 days in advance of shipment of plant material.
- .2 Schedule to include:
 - .1 Quantity and type of plant material.
 - .2 Shipping dates.
 - .3 Arrival date on site.
 - .4 Planting dates.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit the following documents in accordance with the general terms and conditions of the contract.

- .2 Product Data:
 - .1 Submit manufacturer s instructions, printed product literature and data sheets for plant material, fertilizer, mycorrhiza, anti-desiccant, anchoring equipment and mulch. Product data to include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit product data for:
 - .1 Mycorrhiza.
 - .2 Anti-desiccant.
 - .3 Guying assembly including clamps, collar, guying wire, anchors and wire tightener.
 - .4 Mulch.
- .4 Proof of order of plant material: two weeks after the contract is signed, the contractor shall provide proof of having placed firm orders for the plant material from its suppliers. The contractor shall send the Departmental Representative a copy of the purchase order issued to each of its suppliers. Purchase order to include but is not limited to the following information:
 - .1 Date of confirmation of the order.
 - .2 List of the plants ordered and reserved.
 - .3 Supplier's contact information (telephone number, representative's name, and company number).
- .5 Samples:
 - .1 Submit samples of mycorrhiza mulch.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
 - .2 Protect plant material from damage during transportation:
 - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
 - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
 - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.

- .2 Storage and Handling Requirements:
 - .1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.
 - .2 Protect stored plant material from frost, wind and sun and as follows:
 - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.
 - .2 For pots and containers, maintain moisture level in containers.
 - .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
 - .3 Store and manage hazardous materials in accordance with manufacturer s written instructions.
- .3 Packaging waste management: recover for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 WARRANTY

- .1 The Contractor hereby warrants that plant material as itemized on plant list will remain free of defects in accordance with General Conditions for 1 full growing season, the work being subject to a single inspection, providing adequate maintenance has been provided.
- .2 End-of-warranty inspection will be conducted by the Departmental Representative.
- .3 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

Part 2 Products

2.1 PLANT MATERIAL

- .1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
 - .1 Source of plant material: grown in Zone 4a, in accordance with Plant Hardiness Zones in Canada.
 - .2 Plant material must be planted in zone specified as appropriate for its species.
 - .3 Plant material in location appropriate for its species.
- .2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .3 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

- .4 Collected stock: maximum 40 mm in caliper, with well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.
 - .1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.
 - .2 Leave remainder for natural dispersal and as food for dependent organisms.

2.2 WATER

- .1 Free of impurities that would inhibit plant growth.

2.3 STAKES

- .1 T-bar, steel, 40 x 40 x 5 x 2440 mm.

2.4 WIRE TIGHTENER

- .1 Type 2: turnbuckle, galvanized steel, 9.5 mm diameter with 270 mm open length.

2.5 GUYING WIRE

- .1 Cables for wall anchors: Stainless-steel twisted cable, 5mm in diameter, with oval ring at the ends closed with stainless steel cable lug.

2.6 CLAMPS

- .1 U-bolt: galvanized, 13 mm diameter, c/w curved retaining bar and hex nuts.

2.7 ANCHORS

38 x 38 x 460 mm steel.

2.8 GUYING COLLAR

- .1 Tube: plastic, 13 mm diameter, nylon reinforced.

2.9 TRUNK PROTECTION

- .1 Protective material: PVC drainage pipe, 150 mm Ø or fine mesh wrap-around guard 110 mm Ø, height 550 mm.

2.10 CONTINUOUS PLANTING PIT SYSTEM

- .1 Continuous planting pit system in urban setting in cells including:
 - Component: One base, six 2x posts and one deck.
 - .1 Dimensions of assembled system (for each cell): 1200 mm long by 600mm wide by 784 mm high
 - .2 Fabrication and composition of cells:
 - Base and posts: Homopolymer polypropylene.
 - Decks: fiberglass reinforced, chemically-coupled, impact modified polypropylene.
 - .3 System installation accessories:

- Anchor rods: Threaded anchor rod for the 10-inch (254mm) configuration to anchor the assembly to the sublayer.
- Antirroot barrier: Recycled moulded black panels, manufactured with at least 50% recycled polypropylene plastic, containing UV-ray inhibitors and a slide-attachment system that enables the pieces to be attached to one another quickly; to redirect the tree roots deeper and away from solid structures.
- Geogrid: Net-shaped uni-axial or bi-axial geogrid made of braided polyester fabric, with PVC coating, inert and resistant to biodegradation, that resists chemicals naturally present in the soil, alkaline substances and acid; used to provide a stabilizing force to the soil structure by means of the soil that fills the empty spaces in the grid.
- Geotextile membrane: Composed of high-strength polypropylene fibres, woven into a fabric so that the fibres retain their initial positions, inert and resistant to biodegradation and to chemicals, alkaline substances and acids.
- Plastic clamping collars: A device for applying tension or a tool used to attach items that are similar to or different from each other with a specified degree of tension.

2.11 MULCH

Ramial chipped wood mulch consisting of crushing residues of wood twigs of less than 70 mm diameter from a mixture of noble trees: hard wood with high tannin content.

2.12 FERTILIZER

- .1 Synthetic commercial type as recommended by soil test report.
 - .1 Use fertilizer as recommended by manufacturer's written recommendations.

2.13 MYCORRHIZA

- .1 Inoculant: mycorrhizal fungi containing 15 spores/g *Glomus intraradices*, 1 x 10⁵ spores/g *Pisolithus tinctorius*, 7.5 x 10³ spores/g *Scleroderma cepa*, 7.5 x 10³ spores/g *Scleroderma citrinii*, 3.75 x 10³ spores/g *Rhizopogon roseolus*, 3.75 x 10³ spores/g *Rhizopogon subscaerulescens*, 3.75 x 10³ spores/g *Rhizopogon villosulus*, 3.75 x 10³ spores/g *Rhizopogon vulgaris*, and 2.25 x 10³ spores/g *Laccaria laccata*. This inoculant shall be used for all trees and shrubs. The amount of inoculant required is 125 mL for planting shrubs in 2-gallon pots and 250 mL for planting trees.
 - .1 Ensure new root growth is in contact with mycorrhiza.
 - .2 Use mycorrhiza as recommended by manufacturer's written recommendations.

2.14 ANTI-DESICCANT

- .1 Wax-like emulsion.

2.15 FLAGGING TAPE

- .1 Fluorescent, orange colour.

2.16 SOURCE QUALITY CONTROL

- .1 Obtain approval of plant material from the Departmental Representative prior to planting.
- .2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

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 filter installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of the Departmental Representative.
 - .2 Inform the Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Commence installation only upon correction of unacceptable conditions and upon approval in writing of Ministerial Representative.

3.2 PRE-PLANTING PREPARATION

- .1 Proceed only after receipt of written acceptability of plant material from the Departmental Representative.
- .2 Remove damaged roots and branches from plant material.
- .3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer s instructions.
- .4 Locate and protect utility lines.
- .5 Notify and acquire written acknowledgement from utility authorities before beginning excavation of planting pits for trees and shrubs.

3.3 TRANSPLANTING OF TREES

- .1 Identification of trees:
 - .1 The contractor shall identify, on site, with the Departmental Representative, every tree that must be transplanted.
 - .2 The contractor shall inform the Departmental Representative of any visible or foreseeable constraints that might interfere with the transplanting work.
- .2 Obstacles to transplanting:
 - .1 The contractor may, under the supervision of the Departmental Representative and when deemed necessary, prepare the ground to facilitate the approach of the transplanting equipment.
- .3 Transplanting location:
 - .1 The contractor shall determine, on site, with the Departmental Representative, the location to which the trees will be transplanted within a 20 km radius.

- .4 Pruning of branches:
 - .1 When branches in the area where equipment will be operating may be damaged by the work, the Departmental Representative shall indicate on site the interfering branches to be removed.
 - .2 This protective pruning must be performed before the equipment is operated and must be performed in accordance with the thinning method prescribed in standard BNQ 0605-200.
- .5 Transplanting:
 - .1 The contractor shall submit to the Departmental Representative, for approval, an intervention method to ensure the success of the transplanting work, making sure to provide the appropriate size of transplanter to maximize the chances of success.
 - .2 In the case of immediate transplanting, the contractor shall:
 - .1 Excavate the hole using a truck-mounted transplanter with three hydraulic shovels to extract the tree;
 - .2 Extract the plants carefully, with a transplanter or extractor, so that the root balls remain intact.
 - .3 Transplant the tree directly to the planned location.
 - .3 If stone, wood, concrete or other underground obstructions make it impossible to transplant the tree, the Departmental Representative shall approve the decision not to transplant it and the machinery shall be moved to another tree to be transplanted.
 - .4 Cutting of roots:
 - .1 The contractor shall have specialized personnel, following the instructions of the Departmental Representative, make clean or surgical cuts of any tree roots exposed and damaged by the excavation work or by the removal of existing structures.

3.4 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .2 For individual planting holes:
 - .1 Stake out location and obtain approval from the Departmental Representative prior to excavating.
 - .2 Excavate to depth and width as indicated.
 - .3 Remove rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
 - .4 Scarify sides of planting hole.
 - .5 Remove water which enters excavations prior to planting. Notify the Departmental Representative if water source is ground water.

3.5 PLANTING

- .1 For bare root stock, place 50 mm backfill soil in bottom of hole.
 - .1 Plant trees and shrubs with roots placed straight out in hole.
- .2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.
 - .1 Do not pull burlap or rope from under root ball.
- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated.
 - .1 Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 For trees and shrubs:
 - .1 Backfill soil in 150 mm lifts.
 - .1 Tamp each lift to eliminate air pockets.
 - .2 When two thirds (2/3) of depth of planting pit has been backfilled, fill remaining space with water.
 - .3 After water has penetrated into soil, backfill to finish grade.
 - .2 Form watering saucer as indicated.
- .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .7 Water plant material thoroughly.
- .8 After soil settlement has occurred, fill with soil to finish grade.

3.6 TRUNK PROTECTION

- .1 Install trunk protection on deciduous trees as indicated by manufacturer.
- .2 Install trunk protection prior to installation of tree supports when used.

3.7 TREE SUPPORTS

1. Install the tree supports (steel stake) according to the instructions.
2. Place two tree supports according to the direction of the dominant winds a distance of at least 150 mm from the trunk.
3. Press the three supports at a depth of at least 150mm in the unstirred soil, below the roots.
4. Ensure that the three supports are solids, verticals and that they are not cracked or damaged.
5. Install two polyethylene strip and rigid #10 steel wire placed at 2/3 of the tree height.
6. Connect the polyethylene strip with the steel wire to the tutors.

3.8 TENSIONING SYSTEM

- .1 Install tree supports as indicated.

- .2 Place stake on prevailing wind side and 150 mm minimum from trunk.
- .3 Drive stake minimum 150 mm into undisturbed soil beneath roots.
- .4 Ensure stake is secure, vertical and unsplit.
- .5 Install 150 mm long guying collar 1500 mm above grade.
- .6 Thread Type 1 guying wire through guying collar tube.
- .7 Twist wire to form collar and secure firmly to stake. Cut off excess wire.
- .8 Use 3 guy wires and anchors for deciduous trees greater than 3 m and evergreens greater than 2 m.
- .9 Use Type 2 guying wire with clamps for trees less than 75 mm in diameter and Type 3 guying wire with clamps for trees greater than 75 mm in diameter.
- .10 Use Type 1 anchors for trees less than 75 mm in diameter and Type 2 anchors for trees greater than 75 mm in diameter.
- .11 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
- .12 Guying collars to be of sufficient length to encircle tree plus 50 mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.
- .13 Install anchors at equal intervals about tree and away from trunk so that guy wire will form a 45- or 30-degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
- .14 Attach guy wire to anchors. Tension wire and secure by installing clamps.
- .15 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.
- .16 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as directed by City Contract Administrator.
- .17 Install flagging tape to guys as indicated.
- .18 After tree supports have been installed, remove broken branches with clean, sharp tools.

3.9 MULCHING

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated.

3.10 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following maintenance operations from time of planting to acceptance by the Departmental Representative.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.

- .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
- .2 Remove weeds monthly.
- .3 Replace or respread damaged, missing or disturbed mulch.
- .4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
- .5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from the Departmental Representative prior to application.
- .6 Remove dead or broken branches from plant material.
- .7 Keep trunk protection and guy wires in proper repair and adjustment.
- .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.11 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by the Departmental Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Reform damaged watering saucers.
 - .3 Remove weeds twice during the growing season.
 - .4 Replace or respread damaged, missing or disturbed mulch.
 - .5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
 - .6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from the Departmental Representative prior to application.
 - .7 Apply fertilizer in early spring as indicated by soil test.
 - .8 Remove dead, broken or hazardous branches from plant material.
 - .9 Keep trunk protection and tree supports in proper repair and adjustment.
 - .10 Remove trunk protection, tree supports and level watering saucers at end of warranty period. Remove and replace dead plants and plants not in healthy growing condition.
 - .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
 - .12 Submit monthly written reports to the Departmental Representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

- .2 Off-site transplanted trees are excluded from the maintenance program and the warranty.

3.12 VERIFICATION

- .1 Not Used.

3.13 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.

3.14 CLOSEOUT ACTIVITIES

- .1 Submit maintenance reports for plantings.

END OF SECTION

DIVISION 33

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33 - excavating, trenching and backfilling.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A48/A48M-03 (2012), Standard Specification for Grey Iron Castings.
 - .2 ASTM A123/A123M-2012, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM C117-13, Standard Test Method for Materials Finer than 75-mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM C139-11, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - .6 ASTM C478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
 - .7 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³(600 kN-m/m³)).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 CSA Group
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A165 Series-04 (R2009), CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
 - .3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .4 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .4 Ministry of Transport of Quebec
 - .1 Cahier des charges et devis généraux (CCDG)- (Last edition).
- .5 National Plumbing Code of Canada (Last edition).
- .6 Bureau de normalisation du Québec (B.N.Q.) (Last edition) :
 - .1 BNQ 1809-300 : Travaux de construction - Clauses techniques générales - Conduites d'eau potable et d'égout

- .2 NQ 2622-420 : Regard d'égout, puisards et chambres de vannes préfabriqués en béton de ciment armé.
- .3 NQ 3221-500 : Cadres, grilles, tampons, trappes de puisard et bouches à clé - Moulage en fonte grise ou en fonte ductile pour travaux de génie civil - Caractéristiques et méthodes d'essais.

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 maintenance holes, frames and covers, vortex flow regulator and check valves. Product data must include product characteristics, performance criteria, physical size, finish and limitations.

1.4 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 - Quality Control.
- .2 Certifications:
 - .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.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures

1.5 DELIVERY, STORAGE AND HANDLING

- .1 .
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacture's recommendations.
 - .2 Store and protect maintenance holes structures from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Precast catch basin sections: to ASTM C478M, circular or rectangular.
- .2 Joints: made watertight using rubber rings] bituminous compound or epoxy resin cement.
- .3 Mortar:
 - .1 Aggregate:

- .2 Masonry Cement: to CAN/CSA-A3002.
- .4 Ladder rungs: to CSA G30.18, No.25M billet steel deformed bars, hot dipped galvanized to ASTM A123/A123M.
 - .1 Rungs to be safety pattern (drop step type).
- .5 Adjusting rings: to ASTM C478M.
- .6 Concrete Brick: to CAN/CSA-A165 Series.
- .7 Galvanized iron sheet: approximately 2 mm thick.
- .8 Frames, gratings, covers to dimensions as indicated on plans and following requirements:
 - .1 Metal gratings and covers to bear evenly on frames.
 - .1 Frame with grating or cover to constitute one unit.
 - .2 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.
 - .4 Maintenance hole frames and covers: to CCDG.
 - .5 Catch basin frames and covers: to CCDG.
 - .6 Manhole chimney: 762 mm clear diameter.
- .9 Granular bedding and backfill: in accordance with Section 31 05 16 - Aggregate for earthwork.
- .10 Unshrinkable fill: in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

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 maintenance holes and catch basin structures 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 EXCAVATION AND BACKFILL

- .1 Excavate and backfill in accordance with Section 31 23 33 - Excavating Trenching and Backfilling and as indicated on BNQ 1809-300- (Last edition)
- .2 Obtain approval of Departmental Representative before installing, maintenance holes.

3.3 INSTALLATION

- .1 Precast units:
 - .1 Set bottom section of precast unit on top of the granular bed at the levels indicated in the plan.
 - .2 Make each successive joint watertight with Departmental Representative's approved rubber ring gaskets, bituminous compound, epoxy resin cement, or combination of these materials.
 - .3 Clean surplus joint compounds from interior surface of unit as work progresses.
 - .4 Plug lifting holes with concrete plugs set in cement mortar or mastic compound.
- .2 For sewers:
 - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
 - .2 Bench to provide smooth U-shaped channel.
 - .1 The U-shaped channel must be placed in relation to the mid diameter of the sewer pipe.
 - .2 The U-shaped channel must have a smooth curve.
 - .3 The U-shaped channel must have a slope corresponding to the slope of the sewer pipe.
- .3 Install the vortex flow regulator 3.75 L/s as indicated on plan.
- .4 Install the check valves with soft rubber flap as shown on plan.
- .5 Place backfill materials in accordance with 31 23 33 - Excavation, Trenching and Backfilling
- .6 Compact granular backfill in accordance with BNQ 1809-300. (Last edition)
- .7 Place frame and cover on top section to elevation as indicated.
 - .1 If adjustment required use concrete ring.
- .8 Clean units of debris and foreign materials.
 - .1 Remove fins and sharp projections.
 - .2 Prevent debris from entering system.
- .9 Install safety platforms in maintenance holes as indicated on plans.

3.4 FIELD QUALITY CONTROL

- .1 Leakage Test:
- .2 Install watertight plugs or seals on inlets and outlets of each new [sanitary sewer] maintenance hole and fill maintenance hole with water.
- .3 Leakage not to exceed 0.3% per hour of volume of maintenance hole.
- .4 If permissible leakage is exceeded, correct defects.
- .5 Repeat until approved by Departmental Representative.
- .6 Departmental Representative will issue Test Certificate for each maintenance hole passing test.

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.

END OF SECTION

Approved: 2011-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 – Aggregates for earthworks.
- .2 Section 31 23 33 – Excavating, Trenching and Backfilling.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C14M-07, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
 - .2 ASTM C76M-10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
 - .3 ASTM C117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM C443M-10, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
 - .6 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³(600 kN-m/m³)).
 - .7 ASTM D1056-07, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - .8 ASTM D2680-01 (2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
 - .9 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - .10 ASTM F405-05, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
 - .11 ASTM F667-06, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.
 - .12 ASTM F794-03 (2009), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- .2 Bureau de normalisation du Québec (BNQ) (Last edition)
 - .1 BNQ-3624-115 : Tuyaux et raccords en polyéthylène - Tuyaux annelés flexibles pour le drainage - Caractéristiques et méthodes d'essais.
 - .2 BNQ 1809-300 : Travaux de construction - Clauses techniques générales - Conduites d'eau potable et d'égout.
 - .3 NQ 2622-126 : Tuyaux et branchements latéraux monolithiques en béton armé et non armé pour l'évacuation des eaux d'égout domestique et pluvial.

- .4 NQ 3624-135 : Tuyaux et raccords en poly(chlorure de vinyle) non plastifié (PVC-U) - Tuyaux de 200 mm à 600 mm de diamètre pour égouts souterrains et drainage des sols - Caractéristiques et méthodes d'essais.
- .3 Code National de la Plomberie - Canada (Dernière édition).
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-M89, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .5 CSA Group (CSA)
 - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium.
 - .2 CSA A257 Series-M92 (R2009), Standards for Concrete Pipe.
 - .3 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.

1.3 SCHEDULING

- .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.

1.4 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, and backfill and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Shop drawings to indicate proposed method for installing carrier pipe for undercrossings.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Quebec, Canada.
- .4 Certification to be marked on pipe.
- .5 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.
- .6 Manufacturer's Instructions: submit to Departmental Representative a copy of manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 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 CONCRETE PIPE

- .1 Reinforced concrete pipes:
 - .1 Unless otherwise stipulated in the plans, storm sewer pipes measuring 300 mm or more in diameter are to be made of Class IV reinforced concrete. The concrete shall be sound, free of chips and flaws, and pipes shall be of regular shape. Joints shall have rubber gaskets complying with the requirements of the NQ 2622-126 or ASTM C443M standard. When required, the lubricant shall comply with the manufacturer's recommendations.
 - .2 Pipes shall bear the manufacturer's name or trademark, production date, and class of pipe as well as their BNQ number.
 - .3 Prior to the start of the work, the Contactor shall make known the name of the manufacturer of the pipes he intends to use, and which must hold a BNQ certificate for the diameter and class of pipe supplied.
 - .4 The Contractor shall be particularly careful when handling and unloading the pipes, as well as lowering them into the trench to avoid cracking, chipping or breaking them. Any pipe that is damaged in any way whatsoever will be refused by the Departmental Representative and the Contractor shall be required to replace them, whether or not they have been incorporated into the structures.
 - .5 The Departmental Representative reserves the right to require that reinforced concrete pipes be checked for their resistance to collapsing under outside loads. These tests shall be carried out in compliance with the method and requirements of NQ 2622-126 standards. These tests shall be entrusted to a Laboratory selected by the Contractor and approved by the Departmental Representative. Laboratory reports shall be sent to the Departmental Representative at least three (3) days prior to the installation of pipes.
 - .6 All costs incurred for these tests, except for Laboratory tests, shall be the responsibility of the Contractor, including the supply of samples, their transportation to the Laboratory and all related expenses.
 - .7 For each delivery, the Contractor shall provide the Departmental Representative with an attestation of compliance. The attestation of compliance must contain the following information, for each production lot:
 - .1 The name of the pipes manufacturer.
 - .2 The production date and place.
 - .3 The class, category and nominal dimensions.
 - .4 Results of analyses, tests and quality control measures required by the NQ 2622-125 standard "Tuyaux circulaires en béton armé et non armé –

Guide de fabrication et de contrôle de la qualité en usine ” (Circular reinforced and non-reinforced concrete pipes — Guide to production and quality control in the plant).

- .5 The production lot number.
- .8 A production lot consists of pipes of the same class, category and dimension, which have been manufactured during a single ongoing production cycle under the same conditions.
- .2 Lifting holes:
 - .1 Pipe 900 mm and less diameter: no lift holes.
 - .2 Pipe greater than 900 mm diameter: lift holes not to exceed two in piece of pipe.
 - .3 Provide pre-fabricated plugs to effectively seal lift holes after installation of pipe.

- .1 Polyvinyl chloride (PVC) pipes:
 - .1 Type PSM Poly Vinyl Chloride (PVC): in accordance with NQ 3624-130
 - .2 Unless otherwise specified in the plans, storm sewer pipes in diameters of 250 mm or less, as well as catch basin connectors shall be of polyvinyl chloride (PVC).
 - .3 Polyvinyl chloride (PVC) pipes for gravity applications shall comply with the requirements of standard NQ 3624-130, type DR-28.
 - .4 Connectors shall be of the “wide-mouthed” type and consist of a section with a solid wall and rubber gasket installed in the plant and securely blocked to keep it from moving.
 - .5 Monolithic tees used for connecting pipes to the sanitary sewer shall be made of polyvinyl chloride (PVC) complying with the requirements of NQ 3624-130 and NQ 3624-135 standards.
 - .6 Smooth, corrugated or hollow PVC pipes shall be made of a virgin compound approved to 12454-B and 12364-C categories in compliance with ASTM D-1784 as well as NQ 3624-135 and NQ 3624-130 standards.
 - .7 All monolithic tees shall comply with ASTM D-3044 and ASTM F1366 standards. Furthermore, corrugated pipes must meet ASTM F794 and CSA B182.4 standards. Minimum rigidity shall be 300 kPa. Moulded connectors shall comply with CSA B182.1, CSA B182.2 or CSA B182.4 standards as well as NQ 3624-135 and NQ 3624-130 standards. Fabricated fittings shall comply with CSA B182.2 and NQ 3624-135. Furthermore, fabricated fittings for corrugated pipes shall comply with the CSA B182.4 standard.

2.2 PIPE BEDDING AND SURROUND MATERIAL

- .1 As indicated on the plan.
- .2 Granular materials: in accordance with Section 31 05 16 – Aggregates for earthwork.

2.3 BACKFILL MATERIAL

- .1 As indicated on the plan.
- .2 Backfill material in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

2.4 CHANNELS

- .1 In places indicated to the plans, the contractor must install a prefabricated linear channel provided with a perforated stainless steel grate.

- .1 The grate must be capable of supporting punctual loads such as the wheels of trucks or another uniform overload of at least 7 kPa.
 - .2 The grate must allow ease of circulation for people with reduced mobility, people wearing shoes with fine heels as well as the cyclists.
- .2 The channel will have to be in concrete polymer, conceived to support the efforts led by pedestrian loads and of the circulation of the machinery used by the contractor to realize the works:
 - .1 Compression resistance: minimum of 96 MPA
 - .2 Flexion resistance: minimum of 27.6 MPA
 - .3 Traction Resistance: minimum of 10.3 MPA
- .3 The channel shall have an interior width of at least 100mm and be fully compatible with the specified grate. It must be equipped stainless steel angles to receive the grate. It must also be equipped with a fixing system for the grid. Channel sections must have seals between them, the ends must be sealed. The bottom of the gutter must be profiled to obtain a minimum slope of 0.5% in the direction of the catch basins. The top of the grid and stainless steel angles shall be between 3mm and 5mm lower than the finished level of precast concrete pavers.
- .4 At the locations shown on the plans, the linear channel shall be provided with catches basins. The catch basin must be the same width as the channel and have a reserve of 300 mm minimum. The openings for the drain channel shall be fitted with a factory-fitted seal or a sealed connection saddle. The channel drains will be as indicated on the plans.

Part 3 Execution

3.1 PREPARATION

- .1 Clean pipes and fittings of debris and water before installation and remove defective materials from site to approval of Departmental Representative.
- .2 Maintain and protect existing facilities.

3.2 VERIFICATION OF THE LOCATION

- .1 After marking the location of underground installations, and before any pavement cutting or removal, or excavation activities for the installation of the pipes have been carried out, the Contractor shall verify, in the presence of the Departmental Representative, the location of existing sewer pipes.
- .2 The Contractor shall take measures to determine the depth of existing sewer pipes at the point where connections are to be made.
- .3 Following the excavation work, the Contractor shall verify the dimensions, type and condition of the exposed sewer pipe.
- .4 In the event that a condition, which is significantly different from those prescribed in the contract be discovered, the Contractor shall immediately notify the Departmental Representative of this finding.

- .5 When necessary, the profile shall be adjusted according to the Departmental Representative's instructions, so as to avoid any sudden changes in the slope and alignment of the sewer pipe and connection.

3.3 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Protect trench from contents of sewer.
- .3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.4 GRANULAR BEDDING

- .1 As indicated on plan.
- .2 Place bedding in unfrozen condition.
- .3 Place granular bedding material in uniform layers not exceeding 200 mm compacted thickness to the indicated depth.
- .4 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .1 Do not use blocks when bedding pipes.
- .5 Shape transverse depressions as required to suit joints.
- .6 Compact each layer full width of bed to at least 90% corrected maximum dry density or as indicated on plans.
- .7 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

3.5 INSTALLATION

- .1 Install pipes and execute joints in accordance with BNQ 1809-300 (latest edition)
- .2 Pipes shall be installed in compliance with contract plans, with all necessary connections and accessories. The Contractor shall clean the extremities and interior of the various parts prior to their assembly. All pipes shall have rubber gaskets.
- .3 Installation work shall be carried out dry at the bottom of the trench, in keeping with the requirements of Section 31 23 33 - Excavating, Trenching and Backfilling. The Contractor shall install pipes starting with the lowest point in the system, moving up the slope. Female pipe extremities shall be positioned upstream. The Contractor shall keep earth or debris from entering the pipes during installation. All pipes shall be installed in a straight line; each change in direction shall involve only one manhole. All pipes incorrectly aligned or collapsing following installation shall be removed and placed on a new bed.
- .4 Seal all lifting holes using prefabricated plugs approved by the Departmental Representative and secured with unshrinkable grout.

- .5 As needed, pipes shall be cut to accommodate special gaskets, connections and plugs, according to the manufacturer's instructions, without damaging the pipe or its coating, and to ensure that the tip of the pipe is smooth and perpendicular to the latter's axis.
- .6 Joint deflection permitted within limits recommended by pipe manufacturer.
- .7 Water to flow through pipes during construction only if permitted by Departmental Representative.
- .8 Joints:
 - .1 Concrete pipe:
 - .1 Install gaskets as recommended by manufacturer.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
 - .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer s recommendations.
- .9 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent creep during down time.
- .10 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .11 Make watertight connections to manholes and catch basins.
 - .1 Use shrinkage compensating grout when suitable gaskets are not available.

3.6 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
 - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding [150] mm compacted thickness as indicated.
 - .1 Do not dump material within
- .4 Place layers uniformly and simultaneously on each side of pipe.

- .5 Compact each layer from pipe invert to mid height of pipe to at least 90 % corrected maximum dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % corrected maximum dry density.
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.7 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround, in uniform layers as indicated on plans.
- .3 Place backfill in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

3.8 CHANNEL INSTALLATION

- .1 Channels must be installed as the manufacturer's instructions.
- .2 Channels must be installed as indicated on plans.
- .3 The laying or pouring of concrete for channels concrete supports shall be carried out on a dry granular bed, in accordance with the requirements of Section 31 23 33 - Excavation, Trenching and Backfilling, section 31 05 16 aggregates for earthworks. 03 20 00 - Concrete reinforcement and 03 30 00 - Concrete poured in place.
- .4 The Contractor shall clean the interior of the channels before the delivery of the project.

3.9 UNDERCROSSING

- .1 Excavate working pit as CNESST standards, outside right-of-way to be crossed.
- .2 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pipe.
- .3 Dewater excavation.
- .4 Dewater area of undercrossing.
- .5 Install heavy timber backstop.
- .6 Place encasing pipe to exact line and grade as indicated. Encasing pipe shall undercross obstruction at 90 degrees
- .7 Install encasing pipe by jacking, tunnelling or boring.
- .8 Ensure encasing pipe is not in tension.
- .9 Use mechanical type joints for encasing pipe.
- .10 Place concrete grout levelling pad in encasing pipe. Carefully control level of grout during placing.
- .11 Provide shop drawings showing proposed method of installation for storm sewer pipe.
- .12 Insert storm sewer pipe into encasement pipe, in end with largest opening after placement of levelling pad.

- .13 Use approved blocking method to guide storm sewer pipe in true alignment.
- .14 Clearance between blocks and encasement pipe: maximum 12 mm when storm sewer pipe is in position.
- .15 Join storm sewer pipe one length at time outside encasement pipe. Push storm sewer pipe into position.
- .16 Couplings of storm sewer pipe: not to rest on levelling pad when carrier pipe is in position.
- .17 Place 20 MPa concrete cradle around storm sewer pipe after it is positioned.
 - .1 Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.
- .18 Pressure grout remaining void with grout consisting of one part Portland cement and two parts clean washed sand with only sufficient amount of water added to allow placement.
 - .1 Install pressure grout after storm sewer pipe is secure against flotation.
 - .2 Do not use additives.
- .19 Do field testing before placing concrete cradle and grouting.

3.10 FIELD TESTS AND INSPECTIONS

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction directed by Departmental Representative.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Television and photographic inspections:
 - .1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.
 - .2 Provide means of access to permit Departmental Representative to do inspections.
 - .3 Payment for inspection services in accordance with Price and Payment Procedures in PART 1.

3.11 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

ANNEX



Public place Refection– ICAO House
999, Robert Bourassa in Montreal, Quebec

GEOTECHNICAL INVESTIGATION AND
LIMITED ENVIRONMENTAL
CHARACTERIZATION

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
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Sign-off Sheet

This document entitled Geotechnical Investigation and Limited Environmental Characterization - Public place Refection – ICAO House was prepared by Stantec Experts-conseils ltée (“Stantec”) for the account of Public Services and Procurement Canada (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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**GEOTECHNICAL INVESTIGATION AND LIMITED ENVIRONMENTAL CHARACTERIZATION -
PUBLIC PLACE REFLECTION- ICAO HOUSE**

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1.0 INTRODUCTION

1.1 GENERAL

Stantec Consulting Ltd. (Stantec) was commissioned by Public Services and Procurement Canada (the “Client”) to carry out a Geotechnical Investigation and Limited Environmental Characterization for the project of the refection of the public place located in front of the ICAO house at 999, Robert Bourassa in Montreal, Quebec.

1.2 OBJECTIVE

The geotechnical investigation was completed in order to determine the site characteristics with regards to quality and some properties of the existing fill and groundwater conditions. The objective of the environmental characterization was to determine the environmental quality of the soils to provide guidance on the excavated soils management procedures.

1.3 SITE AND PROJECT DESCRIPTION

According to the information available, the project involves the construction of street furnitures including street lamps, a possible construction of poster column, the relocation of an existing art work, the installation of planter and the refection of pavement. The poster column will measure approximately 3 m long by 3 m wide and 12 m high. The planter will also be used as a protective wall.

The site is relatively flat and is currently landscaped. The Ville-Marie tunnel is located below a large part of the site. The elevation of the tunnel top is not known.

The location of the site is presented on Drawing in Appendix B.

2.0 METHOD OF INVESTIGATION

2.1 SUMMARY OF FIELD WORK

The field investigation was carried out on June 1, 2018, under the supervision of an experimented Stantec technician. It consisted of advancing four (4) boreholes. Borehole Records are provided in Appendix C.

Geotechnical and environmental sampling was carried out in all boreholes. Some laboratory testing was carried out on representative samples to determine the nature and some physical and mechanical soil properties. Chemical analyses were carried out on selected samples to verify the environmental quality of the soils.

2.2 FIELD PROGRAM

2.2.1 Health and Safety

All Stantec representatives and sub-consultants involved in this investigation were aware of Stantec's Health and Safety policies and Safe Work Practices. Safety reports were signed by all participants at the beginning of work. This safety reports purpose is identifying potential hazards in order to prevent any site accidents.

2.2.2 Public utilities locates

Prior to commencing the field investigation, the various public utility companies were consulted through Info-Excavation service, to identify where public utilities cross the property boundaries. In addition, private locates were identified by Radex Inc., a prequalified private locator. Boreholes location were located based on the project requirements in areas free of underground utilities.

2.2.3 Borehole investigation

The four (4) boreholes, designated F18-01 to F18-04, were drilled using a 7822DT Geoprobe operated by Georges Downing Estate Drilling Ltd. The boreholes were carried out under the constant supervision of a qualified Stantec technician.

During the drilling activities, soil samples were recovered at regular intervals using a 51 mm (outside diameter) and 610 mm long Split-spoon sampler of «B» caliber to conduct Standard Penetration Tests (SPTs) in accordance with the procedures outlined in ASTM specification D1586.

Standpipe was installed in F18-02 to facilitate the measurement of the groundwater level at the site.

The excess soil from each borehole was put back in the borehole immediately after the drilling was completed. The soil was put back in the reverse order of their excavation to preserve the original stratigraphy as much as possible.

2.2.4 Soil environmental characterization

The objective of the limited environmental characterization was to verify the environmental quality of the soils in order to provide adequate guidance on the management of soils excavated during the rehabilitation of the public place. The analytical results are compared to the generic criteria of the Intervention Guide - Soil Protection and Contaminated Sites Rehabilitation of the Ministry of Sustainable Development, the Environment and the Fight Against Climate Change (MDDELCC), as well as the limit values defined in Appendix I of the Contaminated Soil Burial Regulations (RESC).

Disposable nitrile gloves were used for the collection of samples that were immediately transferred to glass containers provided by the laboratory for storage and transport to the laboratory. These clearly identified glass containers were subsequently placed in a cooler with ice or ice packs to be kept cool during transport to the laboratory. Prior to testing, each sample was examined (odor, texture, color, etc.).

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Between each sampling, the sampling tools were cleaned based on the applicable requirements outlined in the MDDELCC's *Guide d'échantillonnage à des fins d'analyses environnementales*.

2.2.5 Boreholes location

The boreholes were located on the site in a way to obtain the most representative characterization of the soil in place.

The boreholes locations were recorded using a chain.

The location of the boreholes carried out on Site are presented in Appendix B.

2.3 LABORATORY TESTING

2.3.1 Geotechnical laboratory testing

All samples were used to establish the stratigraphic logs based on visual examination and are presented on the borehole records. To determine the nature and some physical and mechanical soil properties, the following tests were carried out on selected samples:

Table 2-1: Geotechnical tests

Laboratory Tests	Norms	Number of tests
Determination of moisture content	BNQ 2501-170	2
Grain size distribution analysis	BNQ 2501-025	2

The laboratory tests results are provided in appendix D.

Samples remaining after testing will be placed in storage for a period off three (3) months after issuance of the final report. After the storage period, the samples will be discarded unless otherwise directed.

2.3.2 Environmental Laboratory Chemical Analysis

Laboratory chemical analyses were performed by Maxxam Analytics Inc. located in Ville Saint-Laurent. This laboratory is accredited by the Centre d'expertise en analyse environnementale du Québec (CEAEQ) of the MDDELCC for the analysis of the selected parameters.

A total of four (4) soil samples were submitted for laboratory chemical analysis to determine their content for the following parameters:

- Petroleum Hydrocarbons C₁₀-C₅₀ (PH C₁₀-C₅₀);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- 13 Metals (Ag, As, Ba, Cd, Cr, Co, Cu, Sn, Mn, Mo, Ni, Pb, Zn).

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The analytical methods used are presented in the certificates of analysis available in Appendix E.

Samples remaining after testing will be placed in storage for a period off three (3) months after issuance of the final report. After the storage period, the samples will be discarded unless otherwise directed.

3.0 GEOTECHNICAL INVESTIGATION RESULTS

3.1 SUBSURFACE CONDITIONS

The subsurface stratigraphy summary is presented in the following table:

Table 3-1: Subsurface Stratigraphy Summary

Borehole	Concrete slab Thickness (mm)	Topsoil Thickness (mm)	Fill Depth (m)	Depth of borehole (m)
F-18-01	250	-	0,25 – $\geq 1,96$	1,96
F-18-02	-	100	0,10 – $\geq 7,01$	7,01
F-18-03	-	100	0,10 – $\geq 1,83$	1,83
F-18-04	-	100	0,10 – $\geq 1,83$	1,83

3.1.1 Concrete slab

Concrete was encountered at the surface of borehole F18-01. The concrete thickness was 250 mm.

3.1.2 Topsoil

Topsoil was encountered at the surface of boreholes F18-02 to F18-04. The topsoil thickness was 100 mm.

3.1.3 Fill

Fill materials were observed in all boreholes and extended to depth more than 7 meters. Fill materials were composed of a black-brown sandy gravel to gravel and sand with some silt. Residual materials were observed in this layer.

Two (2) representative samples of the fill material were selected for grain size distribution and determination of moisture content. The laboratory results are summarized in the following table and are presented in Appendix D:

Table 3-2: Results of Laboratory Testing on Fill materials

Sample No.	Depth (m)	Moisture content (%)	Fine particles (%)	Sand (%)	Gravel (%)	Classification (USCS)
F-18-02 SS-01	0.10 – 0.61	2.6	13.3	31.7	55.0	GM or GC
F-18-02 SS-04	1.83 – 2.44	4.3	18.5	34.9	46.6	GM or GC

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The borehole F-18-01 was interrupted in the fill materials following an inferred block or rock refusal.

3.2 GROUNDWATER

Groundwater was not noted in the standpipe during the course of the investigation.

It should be noted that groundwater levels can be expected to fluctuate during periods of heavy precipitation associated with seasonal weather trends, in response to specific rain events, or because of site use, adjacent site use, and construction activity.

4.0 ENVIRONMENTAL RESULTS

4.1 APPLICABLE CRITERIA

Although the site is located on property under federal jurisdiction, only provincial criteria were used because the purpose of the study is to ensure an adequate management of the soils that will be placed off-site.

The results of the chemical analyses carried out on the soil sample analyzed were compared with the generic set of criteria presented in the Quebec Intervention Guide - Soil Protection and Contaminated Land Rehabilitation (MDDELCC, 2016), the "Intervention Guide ". The results were also compared to the Appendix I of Contaminated Soil Burial Regulations (RESC) of the MDDELCC that determine the critical values beyond which the soil can't be put in a landfill without prior treatments.

4.2 SOIL CHEMICAL ANALYSIS RESULTS

Four (4) soil samples, including a duplicate soil sample, were selected for laboratory analyses. The collected samples are representative of the fill layer. The summary of chemical analysis results is presented in the following table and the details are presented in Appendix E. The laboratory certificate of analyses is also included in Appendix E.

Table 4-1: Summary of Soil Chemical Analysis Results

Sample Depth (m)	PH C ₁₀ -C ₅₀	PAH	Metals 13 elements
F-18-01-CF-02 (0,61 – 1,22)	<A	<A	<A
F-18-03-CF-01B et DUP-2018-06-01-A (0,10 – 0,61)	<A	A-B	<A
F-18-04-CF-03 (1,22 – 1,83)	<A	<A	<A

The chemical analytical results revealed that analyzed soil samples were below the MDDELCC *Intervention Guide C* criteria. However, excavated soils must be managed in accordance with the soil management grid presented in Appendix 5 of the intervention guide.

4.3 QUALITY CONTROL RESULTS

The quality control program includes the collection and analysis of duplicate samples. Those samples were recovered at the same time than the original samples and subjected to chemical analyses in the laboratory for a 10% minimal ratio.

As recommended by the CEAEQ, only results that showed concentrations for the original sample (F-18-03-CF-01B) and its duplicate (DUP-2018-06-01-A) greater than 10 times the reported detection limit were statistically analyzed. The percentage of relative difference (PRD) for a sample to be considered acceptable is set at 30%. The PRD calculated for barium and manganese are 16% and 2%, which is lower than the CEAEQ acceptability range. The PRD calculated for nickel is 67%, which is higher than the CEAEQ acceptability range. The relative difference calculated is certainly due to the heterogeneity of the fill materials. However, the measured results are all below criterion A and therefore all considered natural levels, so the variability of the results is acceptable.

Furthermore, when the results between the original sample and the duplicate vary, the higher analytical result is applied for the interpretation. The chemical analytical results are presented in Tables E-1, while the quality control results are presented in Table E-2, in Appendix E.

Maxxam carried out its own quality control investigations on the samples collected for testing. All the quality control investigations done by Maxxam, the level of fortified blanks, the blanks method and the surrogates, were within the acceptability criteria zone of the laboratory. The results are therefore considered valid.

5.0 ENVIRONMENTAL SOIL MANAGEMENT

For the analyzed parameters, all soil samples selected for environmental analyses showed concentrations below the MDDELCC "B" criteria.

5.1 MANAGEMENT OF EXCAVATED SOILS

As part of the planned work, it is recommended that the excavated materials generated by any future excavation work be managed according to the Management Grid for Excavated Soil included in the MDDELCC Intervention Guide as well as Section 4 of the Contaminated Soil Burial Regulations (RESC).

5.1.1 Less-than-A Soils

The use of excavated soil that exhibits contaminant concentrations that are less than the Intervention Guide A criterion is unrestricted as long as it doesn't contain any residual materials or exhibit visual or olfactory evidence of contamination by petroleum products.

5.1.2 A-B Soils

With the exception of the Site from which it originated, soil exhibiting contaminant concentrations within the A-B range can only be disposed on soil exhibiting contaminant concentrations that are equal to or higher than the A-B soil, and if it does not exhibit any perceptible hydrocarbon odors. Soil of this type can also be used as backfill on land being redeveloped for residential purposes as long as its use is part of a remediation project that is being carried out in conformity with the Environment Quality Act (EQA). Finally,

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this type of soil can be reused as cover material at landfill sites. Details concerning the available management options are presented in the Management Grid for Excavated Soil included in Appendix F.

6.0 GEOTECHNICAL ENGINEERING ASSESSMENT

The boreholes were carried out to provide the information required for the rehabilitation of the public place, including the design of the foundations of the poster column.

The following geotechnical recommendations are based on the information provided by the client and on the properties of the soils encountered in the boreholes.

6.1 FROST PENETRATION

Frost penetration depth for foundation design at this site is 1.7 m. It's recommended that foundations be founded at least at this depth.

Insulation equivalent to 1.7 m of soil cover is required to protect soil beneath the foundations if the full soil cover is not provided.

6.2 SHALLOW EXCAVATION

Shallow excavations are anticipated to be advanced within the fill materials. If the available space allows it, the excavations could be carried out in open trenches. The contractor must excavate the walls at inclinations allowing their stability during the field activities. However, it is recommended to work on small sections and backfill as work progress.

It is recommended not to park heavy vehicles at the edge of the slope at a distance less than the depth of the excavation. It is also recommended to avoid vehicles circulation at the top of excavations, within a distance of less than the depth of the excavation to minimize vibration. It will also be important to keep a distance at least equal to the depth of the excavation between the edge of the slope and the base of the piles of materials stored on site.

It is important to note that for temporary excavations, the contractor is responsible at all times for their stability, the safety of the workers and the stability of the surrounding structures.

In addition to these recommendations, all excavation conditions must comply with the standards of the « Commission des normes, de l'équité, de la santé et de la sécurité du travail » (CNESST) in order to carry out the field activities safely for all the workers.

If excavations without a support system remain open for extended period of time, it is recommended that daily inspections be conducted by specialized geotechnical personnel to identify the risk of failure and determine the actions to be taken in case of anomalies.

6.2.1 Temporary support system

In case where unsupported, stable and safe slopes could not be conducted, the use of a temporary support system is required. The temporary support system should be designed while taking into consideration the soil stratigraphy (fill materials), the most unfavorable position of the groundwater table, as well as existing structures nearby.

Following table presents the average geotechnical soil parameters that should be considered in the design of the support system, assuming that the interaction soil/support (friction or cohesion) is insignificant.

Table 6-1: Average geotechnical parameters of the soil

Parametre	Sandy gravel fill
Angle of wall friction (Φ)	33°
Cohesion C' (kPa)	0
Coefficient of earth pressure at rest (K_0^*)	0,455
Coefficient of active earth pressure (K_a^*)	0,295
Coefficient of passive earth pressure (K_p^*)	3,392
Total unit weight	20,0
Submerged unit weight	10,2
(*) : Vertical walls and horizontal slope surface ($\beta = 0^\circ$, $\delta = 0$ et $\alpha = 90^\circ$)	

6.2.2 Groundwater Control

Inflows could occur during excavation work depending on the season and the depth of the excavation.

An adequate and effective pumping system should be provided to remove precipitation, runoff and seepage water that may be present in excavations during construction. The water will have to be evacuated progressively so that the subgrade remains always well drained and stable.

6.3 FOUNDATIONS – POSTER COLUMN AND PLANTER

Fill materials are inadequate to support any construction. However, based on the expected load (low loads) and acceptable settlement, shallow foundations supported by the existing fill may be used. Screw piles could also be considered.

6.3.1 Shallow foundations

The following recommendations are presented according to the national building code, 2010 (NBC 2010). The sub-section 4.1.3 of the NBC requires the design of foundations be done in accordance with the limit states method. The Limit States requested in the NBC and the ones used in this project are the following:

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- Ultimate Limit States (ULS);
- Serviceability Limit States (SLS).

The Ultimate Limit State mainly covers structure collapse mechanisms and therefore, it covers the security. The Serviceability Limit State covers the mechanisms that prevent or limit the intended use of the structure, for example, total and differential settlements.

The values of the geotechnical bearing resistances (bearing capacity) of the Ultimate Limit States (ULS) and the Serviceability Limit states (SLS) presented in the following table are recommended for foundations located at 1.7 m in depth on the existing fill.

Table 6-2: Geotechnical Resistances

Geotechnical Resistances	Strip Footing Width $0.9\text{m} \leq B \leq 3.0\text{m}$
Ultimate Limit States (ULS)	300 kPa
Serviceability Limit States (SLS)	50 kPa

The above ULS value includes a geotechnical resistance factor of 0.5 (NBC 2010).

Given the nature of the soil encountered in boreholes (fill materials), differential settlements are anticipated under the projected structures.

6.3.2 Coefficient of Sliding Friction

Sliding resistance can be calculated using the following unfactored friction coefficients.

Table 6-3: Unfactored Friction Coefficient

Condition	Unfactored Friction Coefficient
Between Concrete and Structural fill / Granular pad	0,55
Between Concrete and existing fill	0,40

In accordance with the Canadian Foundation Engineering Manual, a resistant factor of 0.8 should be used when calculating the ULS resistance to sliding.

6.3.3 Subgrade Preparation

All topsoil, frozen soils, and fill materials inadequate to support construction must be entirely removed from the zone of the proposed foundations. It is recommended to densify the bottom before laying the foundations.

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Experienced geotechnical personnel should inspect the prepared subgrade surfaces to ensure that the soils are the same in nature as those identified in the boreholes and that there is no debris, heterogeneous fill, organic soil, compressible material, block larger than 300 mm, etc.

6.3.4 Foundation Backfill

Foundation backfill should be carried out using draining material containing less than 10% of particles passing the 80 μm sieve, such as, MG-20, MG-112 or a class «A» material placed in layers not thicker than 300 mm and compacted to 95% of the optimum dry density determined by a modified energy compaction test (Modified Proctor Compaction Test).

In addition, when backfilling exterior foundation walls, transitions of 2.0 horizontal to 1.0 vertical with existing soil should be carried out up to 1.7 m below the finished ground level, if structures such as access roads, sidewalks, slabs, etc. are planned around the proposed structures, to limit frost actions.

6.3.5 Helical screw pile (HSP)

The design of the HSP piles is the responsibility of the supplier and is based on the contractor's installation methodologies, the structural capacity of HSP piles, and the geotechnical parameters of the soil in which the pile will be installed.

In general, HSP piles will need to be designed according to the loads supplied by the structural engineer considering the diameter of the helix plate, the thickness of the shaft, and the torque applied during installation.

For the soil observed in the boreholes, the following geotechnical parameters can be considered by screw pile suppliers:

- Unit weight of the fill material = 20 kN/m³
- Angle of wall friction = 30°

According to the Canadian Foundation Engineering Manual (Section 18.2.1.4, CFEM, 2013), a geotechnical resistance factor coefficient of 0.4 in compression and 0.3 in pull-out shall be used to calculate the weighted axial geotechnical strength at the limit state.

We recommend that the design of the screw piles and the installation method be submitted by the contractor for verification by the structural and geotechnical engineers prior to their delivery to the site. Also, the documentation of each pile describing the magnitude of the installation torque must be submitted to the structural engineer.

6.4 CONCRETE PAVERS

Based on the assumptions that the area will not be cleared of snow and will be destined for pedestrian use, the minimal requirements for the construction of the paving stones are as follows:

- Excavate the existing fill until the proposed infrastructure line ($\pm 480\text{mm}$) and managed the soils in accordance with the MDDELCC Intervention Guide ;

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- Profile and compact the infrastructure surface ;
- Install a type III separation geotextile (CCDG MTMET) ;
- Set up the structure presented in table 6-4 ;
- Install borders or any other type of applicable side supports.

The following table presents the pavement structure recommended for the parking lots exclusively reserved for light vehicles (cars) considering the winter maintenance operations.

Table 6-4: Proposed structure of the public place

Pavement elements	Material types	Minimum thickness (mm)	Compaction
Surficial material	Concrete pavers	100	According to plan and specifications
	Sand	20	
Base	Granular base MG-20	250	Min. 95 % (NQ 2501-255)
Subbase	Materials type MG-112 ⁽¹⁾	300	Min. 95 % (NQ 2501-255)
Total thickness		670	
(1) The granulometry of the material MG 112 used for the sub-foundation must comply with norm NQ 2501-255. Furthermore, according to availability, this material could be replaced by a granular material of type MG 56 or MG 80, recycled or not (MR-1 to MR-5, norm NQ-2560-600). The sub-grade material could be granular base, granular gravel or natural gravel.			

It should be noted that the recommended total thickness of 670 mm is not intended to ensure the complete frost protection and uplift and other deformations could occur in some areas due to the heterogeneity of the existing fill. However, depending on usage and expected service, we propose this structure, similar to bicycle paths, for budgetary reasons. The customer must plan occasional or localized maintenance interventions by readjusting the pavement (removal and installation of the pavement) in the event of subsidence or lifting in order to maintain a good service and an acceptable service life.

The pavement subgrade should be prepared in accordance with the CCDG (MTMET) requirements. All organic materials should be excavated. The subgrade material will be composed of fill materials (sandy gravel, some silt) frost acting type and weather sensitive.

Instability can occur during subgrade preparation, especially following precipitation. The contractor shall use applicable techniques and equipment to evacuate the water. Disturbed and soft materials should be removed at least to 300 mm below the subgrade line and replaced by existing fill if their environmental quality allows it or by class "A" or "B" fill, of similar frost susceptibility. The fill must be compacted according to the usual requirements up to the subgrade line.

In all cases, the subgrade of the proposed area must be prepared to provide a uniform, stable and free of unsuitable materials, debris, organic soils and particles larger than 100 mm. The subgrade line must be compacted more than 95% of the Modified Proctor Compaction Test.

6.4.1 Pavement drainage

The profile of the subgrade (before the foundation materials are laid) should have an adequate slope for water drainage to avoid any accumulation of water on the surface of the subgrade. Surface, precipitation

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and runoff water will also have to be evacuated from the excavations in order to preserve a well-drained subgrade throughout the construction period.

Proper drainage of the subgrade and granular base/subbase must be provided to ensure satisfactory performance. If required, a drain system can be considered on the subgrade line.

The longitudinal and cross-section profile of the surface of the pavement should also be designed with a suitable slope to allow the evacuation of surface water. If ditches are planned, they should be laid out to a minimum depth of 1.0 m from the surface of the pavement.

6.5 REUSE OF ON-SITE MATERIALS

Based on the results of the investigation, the excavated material from existing fill should not be reused as backfilling materials for the foundation or the pavement structure. However, they could be reused as a substitution of unstable soils or at the subgrade line for surface development.

It will be the responsibility of the engineer or supervisor of excavation and backfilling activities to approve the re-use of materials based on the laboratory test results to be completed at the time of those activities.

6.6 RECOMMENDED LEVEL OF INSPECTION

All subgrade shall be inspected by a geotechnical engineer prior to the placement of granular materials, street furniture, etc. to confirm the foundation soils, ensure remediation and confirm the dry condition of the subgrade area. All sources of granular materials imported on site shall be sampled, tested and approved by a geotechnical engineer.

The placement of Structural Fill shall be supervised and tested by geotechnical personnel using nuclear density gauge to ensure all compaction requirements are achieved during construction.

6.7 WINTER CONSTRUCTION

If earthwork is conducted during freezing conditions, special procedures and precautions must be exercised to minimize the risk of future problems.

If construction schedule extends into the winter season, a site meeting should be held in the fall to discuss the schedules of the various contractors in relation to the winter-specific geotechnical recommendations provided herein.

6.7.1 Excavation during Winter Construction

Any overlying snow will reduce the frost penetration. Conducting only the excavation work required for each day of work is recommended to minimize freezing of the soil in the foundation areas.

Excavated material to be used as subgrade fill should not be stockpiled but should be placed and compacted immediately after excavation.

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6.7.2 Fill Placement in Cold Conditions

It is generally impractical to place granular material in temperatures lower than about -5 degrees Celsius. On very cold days, loose material starts to freeze within about 15 minutes. At temperatures below -5 degrees Celsius, placement of engineered fill should be halted and the existing fill materials must be protected from frost penetration.

For intermediate fill lifts, frost protection (e.g.; straw, insulated tarp, etc.) should be provided at the end of the work day, or alternatively, fill that freezes overnight should be removed in the morning. Also, any snow or ice should also be removed. Regular checks of the temperature of the fill should be made. The soil temperature should be greater than +2°C to allow for compaction to the specified degree.

6.7.3 Concrete placement in Cold Conditions

Concrete (prefabricated or poured on site) should not be placed on frozen material.

Following placement of concrete, temporary frost protection must be provided for subgrade soils and concrete during curing.

Excavations should be backfilled with a free-draining granular material.

6.7.4 Geotechnical Inspection and Testing During Winter Construction

Full-time inspection and testing by experienced geotechnical personnel is particularly important during earthworks in winter conditions, due to the importance of validating the quality and state of the exposed subgrade, construction materials, and procedures during placement and/or excavation, and immediately prior to insulating.

APPENDIX A

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Experts-conseils and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Experts-conseils present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Experts-conseils is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Experts-conseils at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Experts-conseils must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Experts-conseils will not be responsible to any party for damages incurred as a result of failing to notify Stantec Experts-conseils that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Experts-conseils, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Experts-conseils cannot be responsible for site work carried out without being present.

APPENDIX B



Color scheme based on MELCC
soil criteria in the "Guide d'intervention -
Protection des sols et de réhabilitation des
terrains contaminés (MELCC)"

Test point identification and sample parameter		Result	
F18-01	CF-4 1,83-2,08m (2018-05-04)	Sample identification, depth and date	
PARAMÈTRE	CODE		
PH C ₁₀ - C ₅₀	●	*≤A* Criteria	
PAH	▲	*A-B* Range	
METALS	◆	*B-C* Range	
	■	*>C* Criteria	

Legend

Property limits

Borehole



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100, boulevard Alexis-Nihon, bureau 110
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Fax: 514.739.8499
www.stantec.com

Important Note
All dimensions shown on this drawing are approximate. The user shall verify and be responsible for all dimensions. Any errors or omissions shall be reported to Stantec without delay.

Client/Project

PUBLIC SERVICES AND PROCUREMENT CANADA

PUBLIC PLACE REFETION - ICAO HOUSE
GEOTECHNICAL INVESTIGATION AND LIMITED ENVIRONMENTAL CHARACTERIZATION

999, ROBERT-BOURASSA BOULEVARD, MONTREAL, QC

Drawing Title

BOREHOLE LOCATION PLAN AND SOIL ANALYTICAL RESULTS






Project No. 159100531.204
Date 2018-06-19

Drawn by J.C.
Drawing No.

Approved by O.A.
1

APPENDIX C






Project: Public place refection - ICAO House - Geotechnical investigation and limited environmental characterization Project No.: 159100531.204 Client: Public Services and Procurement Canada Site: 999, Robert-Bourassa blvd. in Montréal, Qc Figure:	Location : X : Y : Type of borehole : Borehole Equipment : Geoprobe 78220DT Casings : mm Corer : mm	Borehole : F-18-01 Page : 1 of 1 Start date : 2018-06-01 Inspector : E. Girouard Depth : m Elevation : m
--	--	--

SAMPLE TYPE		QUALITATIVE TERMINOLOGY		QUANTITATIVE TERMINOLOGY		SYMBOLS		GROUNDWATER 	
SS	Split spoon	Clay	< 0.002 mm	Traces	< 10 %	N	Standard penetration value		
CS	Continuous sampling	Silt	0.002 - 0.08 mm	Some	10 - 20 %		(ASTM D 1586)	Date	Depth
DC	Diamond rock core	Sand	0.08 - 5 mm	Adjective (...y)	20 - 35 %	Nc	Dynamic cone penetration value	Reading 1	m
AS	Auger	Gravel	5 - 80 mm	and (ex: and gravel)	> 35 %		(BNQ 2501-145)	Reading 2	m
TW	Thin wall sampler	Cobbles	80 - 200 mm	Main word	Dominant fraction	RQD	Rock Quality Designation (%)	Remarks :	
ST	Shelby tube	Boulders	> 200 mm						
MA	Manual sample								
SAMPLE STATE		MECHANIC CHARACTERISTICS OF SOILS				ROCK QUALITY DESIGNATION		JOINTS SPACING	
	Remoulded	COMPACTION	INDEX "N"	CONSISTENCY	Cu OR Su (kPa)	QUALIFICATIVE	RQD	Very tight	< 20 mm
	Intact (thin wall sampler)	Very loose	0 - 4	Very soft	< 12	Very poor	< 25 %	Tight	20 - 60 mm
	Lost	Loose	4 - 10	Soft	12 - 25	Poor	25 - 50 %	Close	60 - 200 mm
	Core (diamond rock core)	Compact	10 - 30	Firm	25 - 50	Fair	50 - 75 %	Moderately spaced	200 - 600 mm
		Dense	30 - 50	Stiff	50 - 100	Good	75 - 90 %	Spaced	600 - 2000 mm
		Very dense	> 50	Very stiff	100 - 200	Excellent	90 - 100 %	Very spaced	2000 - 6000 mm
				Hard	> 200			Wide	> 6000 mm

STRATIGRAPHY					SAMPLES						WATER LEVEL / WATER INFLOW		TESTS				REMARKS
DEPTH (m)	DEPTH (ft)	ELEVATION (m) / DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD	Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	× : N (standard pen.) ▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L 20 40 60 80			
		0.00 0.00 -0.25	Concrete slab.														
		0.25 -0.33 0.33	Fill: Clean stones. Brown-black; Gravel and Sand to Sandy Gravel with some silt. - Moist - Presence of residual materials (brick)			SS-1	A B	N	58	12	6-6						
1						SS-2		B	16	11	7-6-5-5		CA				
5						SS-3		B	50	8	6-4-4-6						
2		-1.96 1.96	End of borehole..			SS-4		B	80	R	50						
3	10																
4																	
15																	
5																	
6	20																
7																	
25																	

General remarks:	Verified by : Oliva Ah-ki géo. stag., M.Sc Date : 2018-12-20
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Project: Public place refection - ICAO House - Geotechnical investigation and limited environmental characterization	Location : X : Y : Type of borehole : Borehole	Borehole : F-18-02
Project No.: 159100531.204	Equipment : Geoprobe 78220DT	Page : 1 of 1
Client: Public Services and Procurement Canada	Casings : mm	Start date : 2018-06-01
Site: 999, Robert-Bourassa blvd. in Montréal, Qc	Corer : mm	Inspector : E. Girouard
Figure:		Depth : m
		Elevation : m

SAMPLE TYPE		QUALITATIVE TERMINOLOGY		QUANTITATIVE TERMINOLOGY		SYMBOLS		GROUNDWATER 										
SS	Split spoon	Clay	< 0.002 mm	Traces	< 10 %	N	Standard penetration value	<table><tr><td></td><td>Date</td><td>Depth</td></tr><tr><td>Reading 1</td><td>2018-06-07</td><td>m</td></tr><tr><td>Reading 2</td><td></td><td>m</td></tr></table>		Date	Depth	Reading 1	2018-06-07	m	Reading 2		m	Remarks : SE
	Date	Depth																
Reading 1	2018-06-07	m																
Reading 2		m																
CS	Continuous sampling	Silt	0.002 - 0.08 mm	Some	10 - 20 %		(ASTM D 1586)											
DC	Diamond rock core	Sand	0.08 - 5 mm	Adjective (...y)	20 - 35 %	Nc	Dynamic cone penetration value											
AS	Auger	Gravel	5 - 80 mm	and (ex: and gravel)	> 35 %		(BNQ 2501-145)											
TW	Thin wall sampler	Cobbles	80 - 200 mm	Main word	Dominant fraction	RQD	Rock Quality Designation (%)											
ST	Shelby tube	Boulders	> 200 mm															
MA	Manual sample																	
SAMPLE STATE		MECHANIC CHARACTERISTICS OF SOILS				ROCK QUALITY DESIGNATION		JOINTS SPACING										
	Remoulded	COMPACTION	INDEX "N"	CONSISTENCY	Cu OR Su (kPa)	QUALIFICATIVE	RQD	Very tight	< 20 mm									
	Intact (thin wall sampler)	Very loose	0 - 4	Very soft	< 12	Very poor	< 25 %	Tight	20 - 60 mm									
	Lost	Loose	4 - 10	Soft	12 - 25	Poor	25 - 50 %	Close	60 - 200 mm									
	Core (diamond rock core)	Compact	10 - 30	Firm	25 - 50	Fair	50 - 75 %	Moderately spaced	200 - 600 mm									
		Dense	30 - 50	Stiff	50 - 100	Good	75 - 90 %	Spaced	600 - 2000 mm									
		Very dense	> 50	Very stiff	100 - 200	Excellent	90 - 100 %	Very spaced	2000 - 6000 mm									
				Hard	> 200			Wide	> 6000 mm									

STRATIGRAPHY					SAMPLES						TESTS			
DEPTH (m)	DEPTH (ft)	ELEVATION (m) / DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD	Standard penetration test BLOWS/150mm	WATER LEVEL / WATER INFLOW	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _L : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	REMARKS
		0.00 0.00 -0.10 0.10	Topsoil. Fill: Brown-black; Sand and gravel, some silt. - Dry - Presence of residual materials (brick)				A B	N	83	34	14-14-20-14			
1			- Moist.			SS-1		N	33	17	6-8-9-10			
5						SS-2		N	33	17	6-8-9-10			
2						SS-3		B	16	17	5-8-9-6			
						SS-4		N	25	12	2-8-4-6			
3						SS-5		N	33	15	8-9-6-4			
						SS-6		N	33	12	3-6-6-13			
4						SS-7		N	58	30	21-14-16-14			
						SS-8		N	21	25	5-16-9-10			
5						SS-9		N	42	25	8-9-16-8			
						SS-10		N	58	30	12-14-16-22			
6		-6.10 6.10	End of sampling. Beginning of dynamic cone penetration test.											
7		7.01 -7.01	Refusal											
25														

General remarks:	Verified by : Oliva Ah-ki géo. stag. M.Sc Date : 2018-12-20
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Project: Public place refection - ICAO House - Geotechnical investigation and limited environmental characterization Project No.: 159100531.204 Client: Public Services and Procurement Canada Site: 999, Robert-Bourassa blvd. in Montréal, Qc Figure:	Location : X : Y : Type of borehole : Equipment : Geoprobe 78220DT Casings : mm Corer : mm	Borehole : F-18-03 Page : 1 of 1 Start date : 2018-06-01 Inspector : E. Girouard Depth : m Elevation : m
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SAMPLE TYPE	SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	QUALITATIVE TERMINOLOGY	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	QUANTITATIVE TERMINOLOGY	Traces < 10 % Some 10 - 20 % Adjective (...) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	SYMBOLS	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	GROUNDWATER						
								<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>Date</th> <th>Depth</th> </tr> <tr> <td>Reading 1</td> <td>m</td> </tr> <tr> <td>Reading 2</td> <td>m</td> </tr> </table>	Date	Depth	Reading 1	m	Reading 2	m
Date	Depth													
Reading 1	m													
Reading 2	m													
Remarks :														

SAMPLE STATE	Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	MECHANIC CHARACTERISTICS OF SOILS	COMPACTION Very loose Loose Compact Dense Very dense INDEX "N" 0 - 4 4 - 10 10 - 30 30 - 50 > 50 CONSISTENCY Very soft Soft Firm Stiff Very stiff Hard Cu OR Su (kPa) < 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200	ROCK QUALITY DESIGNATION	QUALIFICATIVE Very poor Poor Fair Good Excellent RQD < 25 % 25 - 50 % 50 - 75 % 75 - 90 % 90 - 100 %	JOINTS SPACING	Very tight < 20 mm Tight 20 - 60 mm Close 60 - 200 mm Moderately spaced 200 - 600 mm Spaced 600 - 2000 mm Very spaced 2000 - 6000 mm Wide > 6000 mm
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STRATIGRAPHY					SAMPLES							WATER LEVEL / WATER INFLOW	TESTS			REMARKS	
DEPTH (m)	DEPTH (ft)	ELEVATION (m) / DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD	Standard penetration test BLOWS/150mm		GA : grain size analysis S : sedimentometry C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses	× : N (standard pen.) ▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L 20 40 60 80			
		0.00 -0.10 0.10	Topsoil. Fill: Brown-black; Gravel and sand, some silt. - Dry - Presence of residual materials (brick)			SS-1	A B	N	83	46	6-20-26-22	CA					
1						SS-2		B	75	23	15-12-11-9						
5						SS-3		B	63	19	12-9-10-8						
2		-1.83 1.83	End of borehole.														
3	10																
4																	
15																	
5																	
6	20																
7																	
25																	

General remarks:	Verified by : Oliva Ah-ki géo. stag., M.Sc Date : 2018-12-20
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Project: Public place refection - ICAO House - Geotechnical investigation and limited environmental characterization Project No.: 159100531.204 Client: Public Services and Procurement Canada Site: 999, Robert-Bourassa blvd. in Montréal, Qc Figure:	Location : X : Y : Type of borehole : Equipment : Geoprobe 78220DT Casings : mm Corer : mm	Borehole : F-18-04 Page : 1 of 1 Start date : 2018-06-01 Inspector : E. Girouard Depth : m Elevation : m
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SAMPLE TYPE	QUALITATIVE TERMINOLOGY	QUANTITATIVE TERMINOLOGY	SYMBOLS	GROUNDWATER
SS Split spoon CS Continuous sampling DC Diamond rock core AS Auger TW Thin wall sampler ST Shelby tube MA Manual sample	Clay < 0.002 mm Silt 0.002 - 0.08 mm Sand 0.08 - 5 mm Gravel 5 - 80 mm Cobbles 80 - 200 mm Boulders > 200 mm	Traces < 10 % Some 10 - 20 % Adjective (...) 20 - 35 % and (ex: and gravel) > 35 % Main word Dominant fraction	N Standard penetration value (ASTM D 1586) Nc Dynamic cone penetration value (BNQ 2501-145) RQD Rock Quality Designation (%)	<div style="display: flex; justify-content: space-between;"> <div> Date Reading 1 Reading 2 </div> <div> Depth m m </div> </div> Remarks :
SAMPLE STATE	MECHANIC CHARACTERISTICS OF SOILS			JOINTS SPACING
Remoulded Intact (thin wall sampler) Lost Core (diamond rock core)	COMPACTION Very loose Loose Compact Dense Very dense	INDEX "N" 0 - 4 4 - 10 10 - 30 30 - 50 > 50 CONSISTENCY Very soft Soft Firm Stiff Very stiff Hard	Cu OR Su (kPa) < 12 12 - 25 25 - 50 50 - 100 100 - 200 > 200 ROCK QUALITY DESIGNATION QUALIFICATIVE Very poor Poor Fair Good Excellent RQD < 25 % 25 - 50 % 50 - 75 % 75 - 90 % 90 - 100 %	JOINTS SPACING Very tight < 20 mm Tight 20 - 60 mm Close 60 - 200 mm Moderately spaced 200 - 600 mm Spaced 600 - 2000 mm Very spaced 2000 - 6000 mm Wide > 6000 mm

STRATIGRAPHY					SAMPLES						WATER LEVEL / WATER INFLOW		TESTS		REMARKS	
DEPTH (m)	DEPTH (ft)	ELEVATION (m) / DEPTH (m)	DESCRIPTION OF SOILS AND ROCK	SYMBOL	STATE	TYPE N°	SUB - SAMPLE	CALIBER	RECOVERY (%)	N - RQD			Standard penetration test BLOWS/150mm	GA : grain size analysis S : sedimentometry C : consolidation W : water content W _l : liquid limit W _p : plastic limit Dr : specific gravity k : permeability f _c : compressive str. OM : organic matter CA : chemical analyses		× : N (standard pen.) ▽ : Nc (dyn. pen.) ■ : Cu intact □ : Cu remoulded ◆ : Su intact ◇ : Su remoulded W _p W W _L 20 40 60 80
		0.00 -0.10 0.10	Topsoil. Fill: Brown-black; Gravel and sand, some silt. - Dry - Presence of residual materials (brick)			SS-1	A B	N	83	41	5-19-22-25					
1						SS-2		B	63	21	15-6-15-32					
5						SS-3		B	58	27	5-12-15-6					
2		-1.83 1.83	End of borehole.													
3	10															
4																
15																
5																
6	20															
7																
25																

General remarks:	Verified by : Oliva Ah-ki géo. stag., M.Sc Date : 2018-12-20
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APPENDIX D

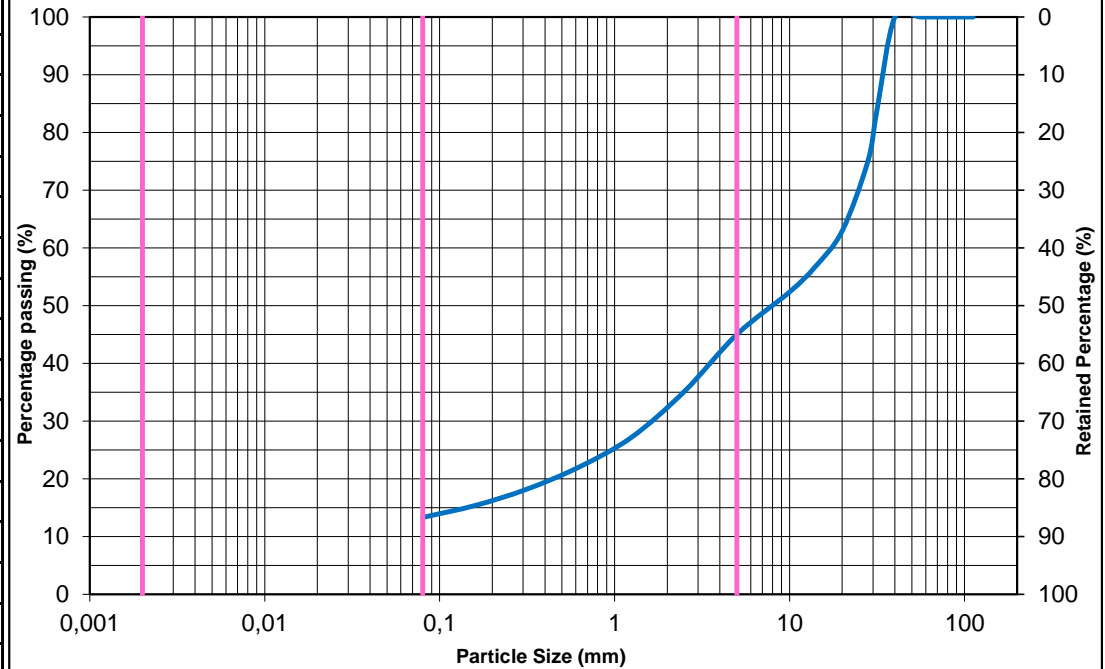
Client : Public Services and Procurement Canada
Project : Public place Refection – ICAO House
999, Robert-Bourassa Boulevard in Montreal, QC
Project No : 159100531
Sample No : BH18-02 SS-02
Depth : 0,61 - 1,22m

Sampled by : Oliva Ah-ki
Sampling Date : June 01, 2018

Material Description : Sandy Gravel, some Silt

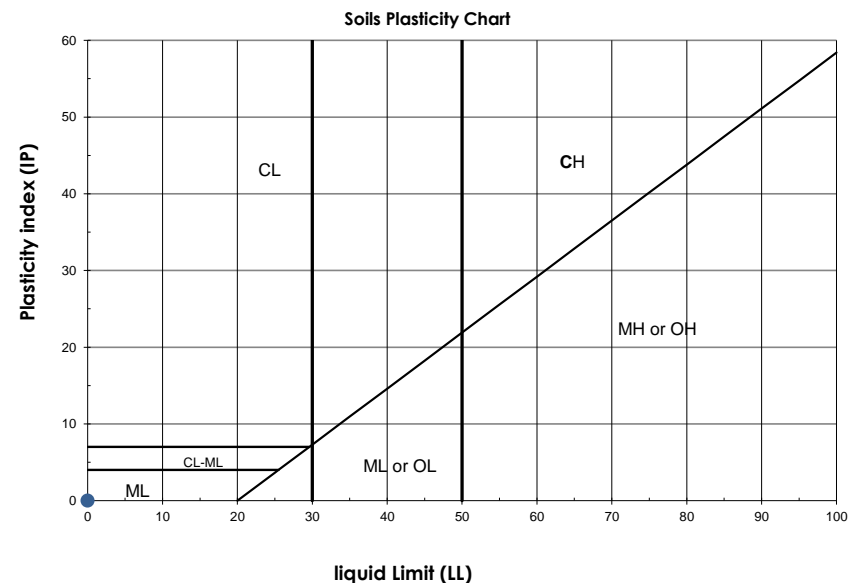
Grain Size Analysis (BNQ 2501-025)

Openings Dimensions	Cumulative Results
mm	%
112	100
80,0	100
56,0	100
40,0	100
31,5	84
28,0	75
20,0	63
14,0	57
10,0	52
5,00	45
2,50	35
1,25	27
0,630	22
0,315	18
0,160	15
0,080	13,3



% Gravel: 55,0 % Sand : 31,7 % Silt: 13,3

Other tests

[illegible]

Remarks :

Prepared by :

Benoit, C. geo.

Date : June 13, 2018

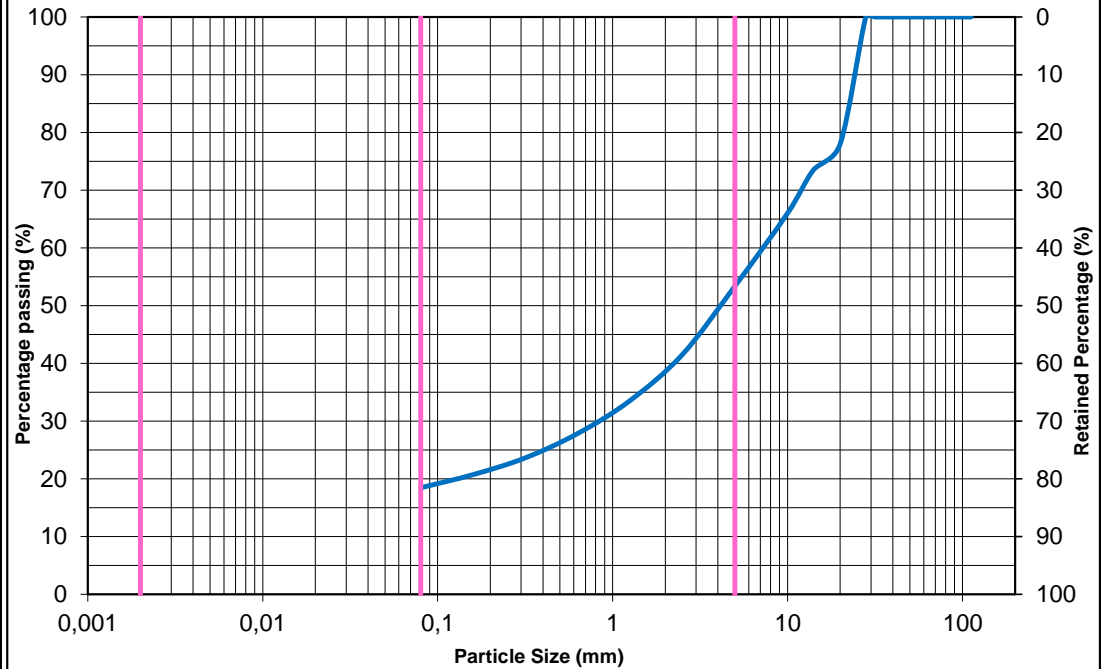
Client : Public Services and Procurement Canada
Project : Public place Refection – ICAO House
999, Robert-Bourassa Boulevard in Montreal, QC
Project No : 159100531
Sample No : BH18-02 SS-04
Depth : 1,83 - 2,44m

Sampled by : Oliva Ah-ki
Sampling Date : June 01, 2018

Material Description : Sandy Gravel, some Silt

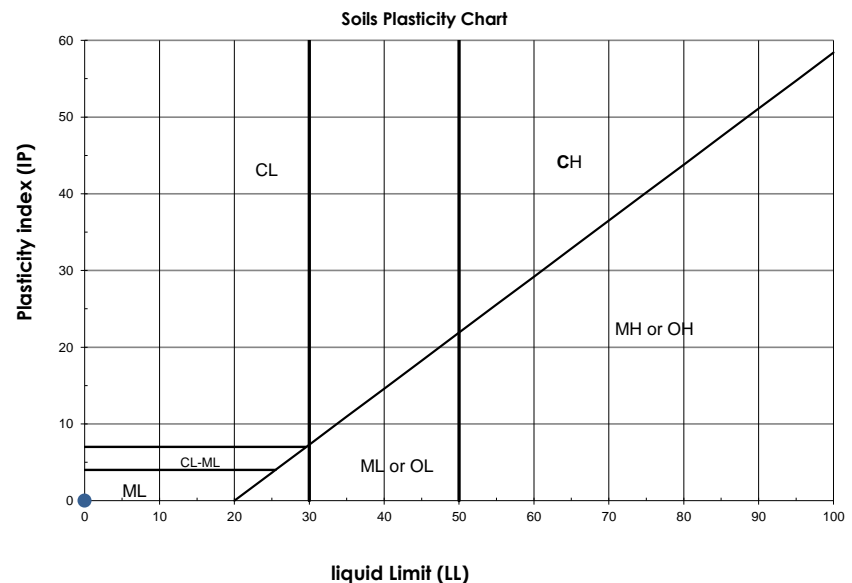
Grain Size Analysis (BNQ 2501-025)

Openings Dimensions	Cumulative Results
mm	%
112	100
80,0	100
56,0	100
40,0	100
31,5	100
28,0	100
20,0	78
14,0	73
10,0	66
5,00	53
2,50	42
1,25	33
0,630	28
0,315	24
0,160	21
0,080	18,5



% Gravel: 46,6 % Sand : 34,9 % Silt: 18,5

Other tests

[illegible]

Remarks :

Prepared by :

BH
Benoit Cyr, geo.

Date : June 13, 2018

APPENDIX E

TableE - 1 : Analytical results for soil samples

Site: ICAO
Dossier Maxxam N°: B820443

Projet N° 159100531.204

Parameters	Units	Intervention Guide ¹ /RPRT ²			RESC ³	Analytical results				
		A	B / Appendix I	C / Appendix II	Annexe I					
Sample ID						F-18-01-CF-02	F-18-03-CF-01B	F-18-04-CF-03	DUP-2018-06-01-A	RDL
Sampling Date (yyyy-mm-dd)						2018-06-01	2018-06-01	2018-06-01	2018-06-01	
Depth (m)										
PAH										
Acenaphtene	mg/kg	0,1	10	100	100	<0,10	<0,10	<0,10	<0,10	0,10
Acenaphtylene	mg/kg	0,1	10	100	100	<0,10	<0,10	<0,10	<0,10	0,10
Anthracene	mg/kg	0,1	10	100	100	<0,10	<0,10	<0,10	<0,10	0,10
Benzo(a)anthracene	mg/kg	0,1	1	10	34	<0,10	<0,10	<0,10	<u>0,11</u>	0,10
Benzo(a)pyrene	mg/kg	0,1	1	10	34	<0,10	<0,10	<0,10	<u>0,12</u>	0,10
Benzo(b)fluoranthene	mg/kg	0,1	1	10	AC	<0,10	<0,10	<0,10	<0,10	0,10
Benzo(j)fluoranthene	mg/kg	0,1	1	10	AC	<0,10	<0,10	<0,10	<0,10	0,10
Benzo(k)fluoranthene	mg/kg	0,1	1	10	AC	<0,10	<0,10	<0,10	<0,10	0,10
Benzo(c)phenanthrene	mg/kg	0,1	1	10	56	<0,10	<0,10	<0,10	<0,10	0,10
Benzo(ghi)perylene	mg/kg	0,1	1	10	18	<0,10	<0,10	<0,10	<0,10	0,10
Chrysene	mg/kg	0,1	1	10	34	<0,10	<0,10	<0,10	<u>0,11</u>	0,10
Dibenz(a,h)anthracene	mg/kg	0,1	1	10	82	<0,10	<0,10	<0,10	<0,10	0,10
Dibenzo(a,i)pyrene	mg/kg	0,1	1	10	34	<0,10	<0,10	<0,10	<0,10	0,10
Dibenzo(a,h)pyrene	mg/kg	0,1	1	10	34	<0,10	<0,10	<0,10	<0,10	0,10
Dibenzo(a,l)pyrene	mg/kg	0,1	1	10	34	<0,10	<0,10	<0,10	<0,10	0,10
7,12-Dimethylbenzanthracene	mg/kg	0,1	1	10	34	<0,10	<0,10	<0,10	<0,10	0,10
Fluoranthene	mg/kg	0,1	10	100	100	<0,10	<0,10	<0,10	<u>0,31</u>	0,10
Fluorene	mg/kg	0,1	10	100	100	<0,10	<0,10	<0,10	<0,10	0,10
Indeno(1,2,3-cd)pyrene	mg/kg	0,1	1	10	34	<0,10	<0,10	<0,10	<0,10	0,10
3-Methylcholanthrene	mg/kg	0,1	1	10	150	<0,10	<0,10	<0,10	<0,10	0,10
Naphtalene	mg/kg	0,1	5	50	56	<0,10	<0,10	<0,10	<0,10	0,10
Phenanthrene	mg/kg	0,1	5	50	56	<0,10	<0,10	<0,10	<u>0,22</u>	0,10
Pyrene	mg/kg	0,1	10	100	100	<0,10	<0,10	<0,10	<u>0,28</u>	0,10
2-Methylnaphtalene	mg/kg	0,1	1	10	56	<0,10	<0,10	<0,10	<0,10	0,10
1-Methylnaphtalene	mg/kg	0,1	1	10	56	<0,10	<0,10	<0,10	<0,10	0,10
1,3-Dimethylnaphtalene	mg/kg	0,1	1	10	56	<0,10	<0,10	<0,10	<0,10	0,10
2,3,5-Trimethylnaphtalene	mg/kg	0,1	1	10	56	<0,10	<0,10	<0,10	<0,10	0,10
TOTAL PETROLEUM HYDROCARBONS										
Petroleum hydrocarbons (C10-C50)	mg/kg	300	700	3500	10000	<100	<100	<100	130	100
METALS										
Silver (Ag)	mg/kg	2	20	40	200	<0,50	<0,50	<0,50	<0,50	0,50
Arsenic (As)	mg/kg	6	30	50	250	<5,0	5,1	<5,0	<5,0	5,0
Barium (Ba)	mg/kg	340	500	2000	10000	48	53	51	45	5,0
Cadmium (Cd)	mg/kg	1,5	5	20	100	<0,50	<0,50	<0,50	<0,50	0,50
Chromium (Cr)	mg/kg	100	250	800	4000	6,4	15	3,7	9,3	2,0
Cobalt (Co)	mg/kg	25	50	300	1500	3,7	9,2	5,1	6,1	2,0
Copper (Cu)	mg/kg	50	100	500	2500	6,3	32	7,6	11	2,0
Tin (Sn)	mg/kg	5	50	300	1500	<4,0	<4,0	<4,0	<4,0	4,0
Manganese (Mn)	mg/kg	1000	1000	2200	11000	260	500	340	490	2,0
Molybdenum (Mo)	mg/kg	2	10	40	200	1,2	1,6	<1,0	<1,0	1,0
Nickel (Ni)	mg/kg	50	100	500	2500	8,7	28	7,6	14	1,0
Lead (Pb)	mg/kg	50	500	1000	5000	<5,0	11	<5,0	26	5,0
Selenium (Se)	mg/kg	1	3	10	50	<1,0	<1,0	<1,0	<1,0	1,0
Zinc (Zn)	mg/kg	140	500	1500	7500	15	82	21	33	10

Notes:

- (1)
(2)
(3)
RDL
- :Intervention Guide PSRTC, MDDELCC, july 2016.
:Land Protection and Rehabilitation Regulation (c. Q-2, r. 37), MDDELCC.
:Regulation respecting the burial of contaminated soils (c. Q-2, r. 18), MDDELCC.
:Reported detection limit.

0,7	: Concentration is within the MEDDLCC Intervention Guide A-B range
5,9	: Concentration is within the MDDELCC Intervention Guide B-C range
300	: Concentration is superior to the MDDELCC Intervention Guide C criteria
300	:Concentration is superior or equal to the limit value in Appendix I of the RESC.

Votre # du projet: 159100531.204

Adresse du site: OACI

Votre # Bordereau: 953560

Attention: Oliva Ah-Ki

STANTEC CONSULTING LTD
MONTREAL
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Suite 110
Ville Saint-Laurent, QC
CANADA H4M 2N6

Date du rapport: 2018/06/07

Rapport: R2374481

Version: 1 - Finale

CERTIFICAT D'ANALYSES

DE DOSSIER MAXXAM: B820443

Reçu: 2018/06/01, 15:45

Matrice: SOL

Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Hydrocarbures pétroliers (C10-C50)	4	2018/06/05	2018/06/06	STL SOP-00172	MA.400-HYD. 1.1 R3 m
Métaux extractibles totaux par ICP	4	2018/06/04	2018/06/04	STL SOP-00006	MA.200-Mét. 1.2 R5 m
Hydrocarbures aromatiques polycycliques	4	2018/06/05	2018/06/06	STL SOP-00178	MA.400-HAP 1.1 R5 m

Remarques:

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.

Les résultats s'appliquent seulement aux échantillons analysés.

Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

Note : Les paramètres inclus dans le présent certificat sont accrédités par le MDDELCC, à moins d'indication contraire.

Votre # du projet: 159100531.204

Adresse du site: OACI

Votre # Bordereau: 953560

Attention: Oliva Ah-Ki

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CERTIFICAT D'ANALYSES

DE DOSSIER MAXXAM: B820443

Reçu: 2018/06/01, 15:45

clé de cryptage

Veillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Rodrigo Caffarengo,

Courriel: RCaffarengo@maxxam.ca

Téléphone (514)448-9001 Ext:7066336

=====

Ce rapport a été produit et distribué en utilisant une procédure automatisée sécuritaire.

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

Dossier Maxxam: B820443
Date du rapport: 2018/06/07

STANTEC CONSULTING LTD
Votre # du projet: 159100531.204
Adresse du site: OACI
Initiales du préleveur: EG

HAP PAR GCMS (SOL)

ID Maxxam					FJ0447	FJ0448	FJ0449	FJ0450		
Date d'échantillonnage					2018/06/01	2018/06/01	2018/06/01	2018/06/01		
# Bordereau					953560	953560	953560	953560		
	Unités	A	B	C	F-18-01-CF-02	F-18-03-CF-01B	F-18-04-CF-03	DUP-2018-06-01-A	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	3.8	6.8	3.7	3.8	N/A	N/A
HAP										
Acénaphthène	mg/kg	0.1	10	100	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Acénaphthylène	mg/kg	0.1	10	100	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Anthracène	mg/kg	0.1	10	100	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Benzo(a)anthracène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	0.11	0.10	1903929
Benzo(a)pyrène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	0.12	0.10	1903929
Benzo(b)fluoranthène †	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Benzo(j)fluoranthène †	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Benzo(k)fluoranthène †	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Benzo(c)phénanthrène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Benzo(ghi)pérylène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Chrysène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	0.11	0.10	1903929
Dibenzo(a,h)anthracène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Dibenzo(a,i)pyrène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Dibenzo(a,h)pyrène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Dibenzo(a,l)pyrène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
7,12-Diméthylbenzanthracène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Fluoranthène	mg/kg	0.1	10	100	<0.10	<0.10	<0.10	0.31	0.10	1903929
Fluorène	mg/kg	0.1	10	100	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Indéno(1,2,3-cd)pyrène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
3-Méthylcholantrène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Naphtalène	mg/kg	0.1	5	50	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Phénanthrène	mg/kg	0.1	5	50	<0.10	<0.10	<0.10	0.22	0.10	1903929
Pyrène	mg/kg	0.1	10	100	<0.10	<0.10	<0.10	0.28	0.10	1903929
2-Méthylnaphtalène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
1-Méthylnaphtalène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
1,3-Diméthylnaphtalène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
2,3,5-Triméthylnaphtalène	mg/kg	0.1	1	10	<0.10	<0.10	<0.10	<0.10	0.10	1903929
Récupération des Surrogates (%)										
D10-Anthracène	%	-	-	-	88	96	94	92	N/A	1903929
D12-Benzo(a)pyrène	%	-	-	-	80	88	80	90	N/A	1903929
D14-Terphenyl	%	-	-	-	76	84	80	78	N/A	1903929
D8-Acenaphthylene	%	-	-	-	86	92	90	90	N/A	1903929
LDR = Limite de détection rapportée										
Lot CQ = Lot contrôle qualité										
N/A = Non Applicable										
† Accréditation non existante pour ce paramètre										

Dossier Maxxam: B820443
Date du rapport: 2018/06/07

STANTEC CONSULTING LTD
Votre # du projet: 159100531.204
Adresse du site: OACI
Initiales du préleveur: EG

HAP PAR GCMS (SOL)

ID Maxxam					FJ0447	FJ0448	FJ0449	FJ0450		
Date d'échantillonnage					2018/06/01	2018/06/01	2018/06/01	2018/06/01		
# Bordereau					953560	953560	953560	953560		
	Unités	A	B	C	F-18-01-CF-02	F-18-03-CF-01B	F-18-04-CF-03	DUP-2018-06-01-A	LDR	Lot CQ
D8-Naphtalène	%	-	-	-	96	102	100	96	N/A	1903929
LDR = Limite de détection rapportée Lot CQ = Lot contrôle qualité N/A = Non Applicable										

Dossier Maxxam: B820443
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HYDROCARBURES PAR GCFID (SOL)

ID Maxxam					FJ0447	FJ0448	FJ0449	FJ0450		
Date d'échantillonnage					2018/06/01	2018/06/01	2018/06/01	2018/06/01		
# Bordereau					953560	953560	953560	953560		
	Unités	A	B	C	F-18-01-CF-02	F-18-03-CF-01B	F-18-04-CF-03	DUP-2018-06-01-A	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	3.8	6.8	3.7	3.8	N/A	N/A
HYDROCARBURES PÉTROLIERS										
Hydrocarbures pétroliers (C10-C50)	mg/kg	300	700	3500	<100	<100	<100	130	100	1903928
Récupération des Surrogates (%)										
1-Chlorooctadécane	%	-	-	-	74	85	84	82	N/A	1903928
LDR = Limite de détection rapportée										
Lot CQ = Lot contrôle qualité										
N/A = Non Applicable										

Dossier Maxxam: B820443
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MÉTAUX EXTRACTIBLES TOTAUX (SOL)

ID Maxxam					FJ0447	FJ0448	FJ0449	FJ0450		
Date d'échantillonnage					2018/06/01	2018/06/01	2018/06/01	2018/06/01		
# Bordereau					953560	953560	953560	953560		
	Unités	A	B	C	F-18-01-CF-02	F-18-03-CF-01B	F-18-04-CF-03	DUP-2018-06-01-A	LDR	Lot CQ
% HUMIDITÉ	%	-	-	-	3.8	6.8	3.7	3.8	N/A	N/A
MÉTAUX										
Argent (Ag)	mg/kg	2	20	40	<0.50	<0.50	<0.50	<0.50	0.50	1903342
Arsenic (As)	mg/kg	6	30	50	<5.0	5.1	<5.0	<5.0	5.0	1903342
Baryum (Ba)	mg/kg	340	500	2000	48	53	51	45	5.0	1903342
Cadmium (Cd)	mg/kg	1.5	5	20	<0.50	<0.50	<0.50	<0.50	0.50	1903342
Chrome (Cr)	mg/kg	100	250	800	6.4	15	3.7	9.3	2.0	1903342
Cobalt (Co)	mg/kg	25	50	300	3.7	9.2	5.1	6.1	2.0	1903342
Cuivre (Cu)	mg/kg	50	100	500	6.3	32	7.6	11	2.0	1903342
Etain (Sn)	mg/kg	5	50	300	<4.0	<4.0	<4.0	<4.0	4.0	1903342
Manganèse (Mn)	mg/kg	1000	1000	2200	260	500	340	490	2.0	1903342
Molybdène (Mo)	mg/kg	2	10	40	1.2	1.6	<1.0	<1.0	1.0	1903342
Nickel (Ni)	mg/kg	50	100	500	8.7	28	7.6	14	1.0	1903342
Plomb (Pb)	mg/kg	50	500	1000	<5.0	11	<5.0	26	5.0	1903342
Sélénium (Se)	mg/kg	1	3	10	<1.0	<1.0	<1.0	<1.0	1.0	1903342
Zinc (Zn)	mg/kg	140	500	1500	15	82	21	33	10	1903342
LDR = Limite de détection rapportée										
Lot CQ = Lot contrôle qualité										
N/A = Non Applicable										

Dossier Maxxam: B820443
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REMARQUES GÉNÉRALES

Tous les résultats sont calculés sur une base sèche excepté lorsque non-applicable.

A,B,C: Les critères des sols proviennent de l'Annexe 2 du « Guide d'intervention-Protection des sols et réhabilitation des terrains contaminés. MDDELCC, 2016. » et intitulé « Grille des critères génériques pour les sols ». Pour les analyses de métaux (et métalloïdes) dans les sols, le critère A désigne la « Teneur de fond Secteur Basses-Terres du Saint-Laurent ».

Les critères A et B pour l'eau souterraine proviennent de l'annexe 7 intitulé « Grille des critères de qualité des eaux souterraines » du guide d'intervention mentionné plus haut. A=Eau de consommation; B=Résurgence dans l'eau de surface

Ces références ne sont rapportées qu'à titre indicatif et ne doivent être interprétées dans aucun autre contexte.

- = Ce composé ne fait pas partie de la réglementation.

Les résultats ne se rapportent qu'aux échantillons soumis pour analyse

Dossier Maxxam: B820443
Date du rapport: 2018/06/07

STANTEC CONSULTING LTD
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Adresse du site: OACI
Initiales du préleveur: EG

RAPPORT ASSURANCE QUALITÉ

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
1903342	DKH	MRC	Argent (Ag)	2018/06/04		101	%
			Arsenic (As)	2018/06/04		92	%
			Baryum (Ba)	2018/06/04		102	%
			Cadmium (Cd)	2018/06/04		101	%
			Chrome (Cr)	2018/06/04		69	%
			Cobalt (Co)	2018/06/04		91	%
			Cuivre (Cu)	2018/06/04		106	%
			Etain (Sn)	2018/06/04		99	%
			Manganèse (Mn)	2018/06/04		89	%
			Molybdène (Mo)	2018/06/04		93	%
			Nickel (Ni)	2018/06/04		95	%
			Plomb (Pb)	2018/06/04		104	%
			Sélénium (Se)	2018/06/04		22	%
			Zinc (Zn)	2018/06/04		107	%
1903342	DKH	Blanc fortifié	Argent (Ag)	2018/06/04		101	%
			Arsenic (As)	2018/06/04		101	%
			Baryum (Ba)	2018/06/04		102	%
			Cadmium (Cd)	2018/06/04		102	%
			Chrome (Cr)	2018/06/04		103	%
			Cobalt (Co)	2018/06/04		100	%
			Cuivre (Cu)	2018/06/04		99	%
			Etain (Sn)	2018/06/04		104	%
			Manganèse (Mn)	2018/06/04		101	%
			Molybdène (Mo)	2018/06/04		101	%
			Nickel (Ni)	2018/06/04		100	%
			Plomb (Pb)	2018/06/04		100	%
			Sélénium (Se)	2018/06/04		100	%
			Zinc (Zn)	2018/06/04		101	%
1903342	DKH	Blanc de méthode	Argent (Ag)	2018/06/04	<0.50		mg/kg
			Arsenic (As)	2018/06/04	<5.0		mg/kg
			Baryum (Ba)	2018/06/04	<5.0		mg/kg
			Cadmium (Cd)	2018/06/04	<0.50		mg/kg
			Chrome (Cr)	2018/06/04	<2.0		mg/kg
			Cobalt (Co)	2018/06/04	<2.0		mg/kg
			Cuivre (Cu)	2018/06/04	<2.0		mg/kg
			Etain (Sn)	2018/06/04	<4.0		mg/kg
			Manganèse (Mn)	2018/06/04	<2.0		mg/kg
			Molybdène (Mo)	2018/06/04	<1.0		mg/kg
			Nickel (Ni)	2018/06/04	<1.0		mg/kg
			Plomb (Pb)	2018/06/04	<5.0		mg/kg
			Sélénium (Se)	2018/06/04	<1.0		mg/kg
			Zinc (Zn)	2018/06/04	<10		mg/kg
1903928	CG2	Blanc fortifié	1-Chlorooctadécane	2018/06/05		81	%
			Hydrocarbures pétroliers (C10-C50)	2018/06/05		89	%
1903928	CG2	Blanc de méthode	1-Chlorooctadécane	2018/06/06		78	%
			Hydrocarbures pétroliers (C10-C50)	2018/06/06	<100		mg/kg
1903929	CP2	Blanc fortifié	D10-Anthracène	2018/06/06		92	%
			D12-Benzo(a)pyrène	2018/06/06		98	%
			D14-Terphenyl	2018/06/06		82	%
			D8-Acenaphthylene	2018/06/06		88	%
			D8-Naphtalène	2018/06/06		98	%

Dossier Maxxam: B820443
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STANTEC CONSULTING LTD
Votre # du projet: 159100531.204
Adresse du site: OACI
Initiales du préleveur: EG

RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
1903929	CP2	Blanc de méthode	Acénaphène	2018/06/06		83	%
			Acénaphthylène	2018/06/06		94	%
			Anthracène	2018/06/06		95	%
			Benzo(a)anthracène	2018/06/06		80	%
			Benzo(a)pyrène	2018/06/06		95	%
			Benzo(b)fluoranthène	2018/06/06		87	%
			Benzo(j)fluoranthène	2018/06/06		102	%
			Benzo(k)fluoranthène	2018/06/06		102	%
			Benzo(c)phénanthrène	2018/06/06		83	%
			Benzo(ghi)pérylène	2018/06/06		95	%
			Chrysène	2018/06/06		82	%
			Dibenzo(a,h)anthracène	2018/06/06		94	%
			Dibenzo(a,i)pyrène	2018/06/06		87	%
			Dibenzo(a,h)pyrène	2018/06/06		88	%
			Dibenzo(a,l)pyrène	2018/06/06		97	%
			7,12-Diméthylbenzanthracène	2018/06/06		90	%
			Fluoranthène	2018/06/06		94	%
			Fluorène	2018/06/06		92	%
			Indéno(1,2,3-cd)pyrène	2018/06/06		98	%
			3-Méthylcholanthrène	2018/06/06		95	%
			Naphtalène	2018/06/06		89	%
			Phénanthrène	2018/06/06		91	%
			Pyrène	2018/06/06		92	%
			2-Méthylnaphtalène	2018/06/06		91	%
			1-Méthylnaphtalène	2018/06/06		87	%
			1,3-Diméthylnaphtalène	2018/06/06		81	%
			2,3,5-Triméthylnaphtalène	2018/06/06		91	%
			D10-Anthracène	2018/06/06		96	%
			D12-Benzo(a)pyrène	2018/06/06		104	%
			D14-Terphenyl	2018/06/06		84	%
			D8-Acenaphthylene	2018/06/06		92	%
			D8-Naphtalène	2018/06/06		100	%
			Acénaphène	2018/06/06	<0.10		mg/kg
			Acénaphthylène	2018/06/06	<0.10		mg/kg
			Anthracène	2018/06/06	<0.10		mg/kg
			Benzo(a)anthracène	2018/06/06	<0.10		mg/kg
			Benzo(a)pyrène	2018/06/06	<0.10		mg/kg
			Benzo(b)fluoranthène	2018/06/06	<0.10		mg/kg
			Benzo(j)fluoranthène	2018/06/06	<0.10		mg/kg
			Benzo(k)fluoranthène	2018/06/06	<0.10		mg/kg
			Benzo(c)phénanthrène	2018/06/06	<0.10		mg/kg
			Benzo(ghi)pérylène	2018/06/06	<0.10		mg/kg
			Chrysène	2018/06/06	<0.10		mg/kg
			Dibenzo(a,h)anthracène	2018/06/06	<0.10		mg/kg
			Dibenzo(a,i)pyrène	2018/06/06	<0.10		mg/kg
			Dibenzo(a,h)pyrène	2018/06/06	<0.10		mg/kg
			Dibenzo(a,l)pyrène	2018/06/06	<0.10		mg/kg
			7,12-Diméthylbenzanthracène	2018/06/06	<0.10		mg/kg
			Fluoranthène	2018/06/06	<0.10		mg/kg
			Fluorène	2018/06/06	<0.10		mg/kg
			Indéno(1,2,3-cd)pyrène	2018/06/06	<0.10		mg/kg

Dossier Maxxam: B820443
Date du rapport: 2018/06/07

STANTEC CONSULTING LTD
Votre # du projet: 159100531.204
Adresse du site: OACI
Initiales du préleveur: EG

RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
			3-Méthylcholanthrène	2018/06/06	<0.10		mg/kg
			Naphtalène	2018/06/06	<0.10		mg/kg
			Phénanthrène	2018/06/06	<0.10		mg/kg
			Pyrène	2018/06/06	<0.10		mg/kg
			2-Méthylnaphtalène	2018/06/06	<0.10		mg/kg
			1-Méthylnaphtalène	2018/06/06	<0.10		mg/kg
			1,3-Diméthylnaphtalène	2018/06/06	<0.10		mg/kg
			2,3,5-Triméthylnaphtalène	2018/06/06	<0.10		mg/kg
<p>MRC: Un échantillon de concentration connue préparé dans des conditions rigoureuses par un organisme externe. Utilisé pour vérifier la justesse de la méthode.</p> <p>Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.</p> <p>Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.</p> <p>Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.</p> <p>Réc = Récupération</p>							

Dossier Maxxam: B820443
Date du rapport: 2018/06/07

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PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Anton Perera, B.Sc., Chimiste



Faouzi Sarsi, B. Sc. Chimiste



Michel Poulin, B.Sc., Chimiste

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Maxxam
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CHAÎNE DE RESPONSABILITÉ

953560

#CdR:

Page 1 de 1

Information facturation		Information rapport		Information projet		Délai d'analyse requis	
Compagnie: STANTEC		Compagnie:		# soumission:		<input checked="" type="checkbox"/> 5 jours régulier	
Attention de: OLYAH-KI		Attention de:		# bon de commande:		SVP aviser votre chargé de projets de toutes demandes de délais rapide	
Adresse: 100 AVENUE DU ST-LAURENT		Adresse:		# projet:	159100531.204	Délai rapide (Surcharges applicables)	
Tél: 514-733-0706		Tél:		Localisation du site:	OACI	<input type="checkbox"/> 8h (même jour)	<input type="checkbox"/> 48h
Courriel:		Courriel:		# site:		<input type="checkbox"/> 24h	<input type="checkbox"/> 72h
				Échantillonneur:	EG	Date requise:	
Critères/Règlement applicable				Analyses requises			
<input checked="" type="checkbox"/> Guide d'intervention (PSRTC) <input type="checkbox"/> RQEP - formulaire MDDELCC requis <input type="checkbox"/> RMD (Mat. lixiviable) <input type="checkbox"/> CMM 2008-47 <input type="checkbox"/> Qualité de l'eau de surface <input type="checkbox"/> CCME <input type="checkbox"/> Dir. 019 (Minier) <input type="checkbox"/> Autre (spécifier) _____				<input type="checkbox"/> Filtration au labo. requise O / N <input type="checkbox"/> BTX <input type="checkbox"/> COV <input type="checkbox"/> FIBTEX <input type="checkbox"/> C10-C50 <input checked="" type="checkbox"/> F2-F4 <input type="checkbox"/> H&G min <input type="checkbox"/> H&G totales <input type="checkbox"/> HAP <input checked="" type="checkbox"/> Phenols 4AAP <input type="checkbox"/> GC/MS <input type="checkbox"/> NO2 <input type="checkbox"/> NO3 <input type="checkbox"/> NO2+NO3 <input type="checkbox"/> Cl <input type="checkbox"/> SO4 <input type="checkbox"/> F <input type="checkbox"/> pH <input type="checkbox"/> Conductivité <input type="checkbox"/> Turbidité <input type="checkbox"/> Métaux extractibles (PSRTC) - sols Ag, As, Ba, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Zn, Se <input type="checkbox"/> Hg <input type="checkbox"/> P-total <input type="checkbox"/> Métaux dissous (PSRTC) - eaux souterraines Al, Si, Ag, As, Ba, Cd, Co, Cu, Mn, Mo, Ni, Pb, Se, Zn <input type="checkbox"/> Bore <input type="checkbox"/> Uranium <input type="checkbox"/> Cr 6 <input type="checkbox"/> DCO <input type="checkbox"/> DBO5 <input type="checkbox"/> MES <input type="checkbox"/> Colif (fec) <input type="checkbox"/> Colif tot <input type="checkbox"/> E.coli <input type="checkbox"/>			
Matrice				# confirmation-délai rapide:			
Eau: Souterraine (S) Surface (Sur) Usée (EU) Potable (P) Captage (C) Lixiviat naturel (LN) Déchet liquide (DL) Sol (Sol) Boue (B) Sédiment (Sed) Solide (SL) Ciment (Cim) Huile (H) Frottis (F) Matière résiduelle (MR) Autre: _____				Réserve au laboratoire Scellé légal O / N Présent Intact N N 24, 23, 23 Réfrigérant présent O / N Instructions spéciales			
Identification de l'échantillon		Date prélèvement (AAAA/MM/JJ)	Heure prélèvement (HH:MM)	Matrice			
1	F-18-01-CF-02	2018/06/01	Am	Sol			
2	F-18-03-CF-01B						
3	F-18-04-CF-03						
4	DR-2018-06-01-A						
5							
6							
7							
8							
9							
10							
Dessais par: (Signature/ lettres moulées)		DATE: (AAAA/MM/JJ)	Heure (HH:MM)	Reçu par: (Signature/ lettres moulées)		DATE: (AAAA/MM/JJ)	Heure (HH:MM)
E. G. R. A. S. S.		2018/06/01	15h30	B. Gabriella Benedetti		2018-06-01	15:45

Sauf accord contraire passé par écrit, les services compris dans cette chaîne de responsabilités sont soumis aux conditions générales standard de Maxxam. Par la signature de cette chaîne de responsabilités, vous confirmez que vous avez pris connaissance des conditions générales et que vous les acceptez telles qu'elles se présentent au <http://maxxam.ca/fr/terms>

COC-1023 (11/2017)

client

APPENDIX F

Annexe 5 : Grille de gestion des sols excavés

La grille de gestion des sols excavés ne s'applique, pour les critères supérieurs à A, que pour une contamination de nature anthropique. Si la concentration naturelle dans le sol est supérieure à A, la gestion des sols contenant cette concentration naturelle est considérée comme équivalente à celle attribuable au critère A.

≤ critère A¹

Utilisés sans restriction sur tout terrain.

< critère B (valeurs limites de l'annexe I du RPRT)

1. Ailleurs que sur le terrain d'origine, les sols ne peuvent être déposés que sur des sols dont la concentration en contaminants est égale ou supérieure à celle des sols remblayés (article 4 du RSCTSC) et s'ils n'émettent pas d'odeurs d'hydrocarbures perceptibles.
2. Aux mêmes conditions, déposés sur ou dans des terrains destinés à l'habitation s'ils sont utilisés comme matériau de remblayage dans le cadre de travaux de réhabilitation de terrains faits conformément à la LQE.

≤ critère B (valeurs limites de l'annexe I du RPRT)

1. Valorisés sur le terrain d'origine ou sur le terrain à partir duquel a eu lieu l'activité à l'origine de la contamination.
2. Valorisés comme matériau de recouvrement journalier ou final dans un lieu d'enfouissement technique (LET) ou comme matériau de recouvrement hebdomadaire ou final dans un lieu d'enfouissement en tranchée ou comme recouvrement mensuel ou final dans un lieu d'enfouissement de débris de construction ou de démolition, conformément au REIMR aux conditions des articles 42, 50, 90, 91, 105 ou 106.
3. Valorisés comme recouvrement final dans un lieu d'enfouissement de sols contaminés (LESC) aux conditions décrites à l'article 38 du RESC ou valorisés dans un système de captage des gaz prévu à l'article 13 du RESC.
4. Valorisés comme recouvrement final d'un lieu de dépôt définitif de matières dangereuses aux conditions de l'article 101 du RMD.
5. Valorisés comme matériau de recouvrement final dans un système de gestion qui comporte le dépôt définitif par enfouissement de déchets de fabriques de pâtes et papiers, aux conditions de l'article 116 du Règlement sur les fabriques de pâtes et papiers (RFPP).
6. Valorisés sur un lieu d'élimination nécessitant un recouvrement, aux conditions prévues au certificat d'autorisation en vertu de l'article 22 de la LQE.
7. Valorisés avec ou sans MRF, comme matériau apte à la végétation dans des projets de restauration d'aires d'accumulation de résidus miniers² ou dans la couverture de lieux visés par le RFPP, le RESC ou le RMD. Ne doit dégager aucune odeur d'hydrocarbures perceptible. Dans le cas d'ajout de MRF, le projet doit être autorisé et respecter le *Guide sur l'utilisation de matières résiduelles fertilisantes pour la restauration de la couverture végétale de lieux dégradés*³.
8. Valorisés comme couche de protection d'une géomembrane utilisée dans un système multicouche lors de la restauration d'une aire d'accumulation de résidus miniers générateurs d'acide².

9. Éliminés dans un lieu d'enfouissement visé par le RESC.
10. Éliminés dans un LET, un lieu d'enfouissement en tranchée, un lieu d'enfouissement en milieu nordique, un lieu d'enfouissement de débris de construction ou de démolition ou un lieu d'enfouissement en territoire isolé, conformément à l'article 4 du REIMR.

≥ critère B et ≤ critère C

1. Utilisés sur le terrain d'origine comme matériau de remblayage à la condition que les concentrations mesurées respectent les critères ou valeurs limites réglementaires applicables aux sols selon l'usage et le zonage.
2. Valorisés comme matériau de recouvrement dans un LET ou comme matériau de recouvrement hebdomadaire dans un lieu d'enfouissement en tranchée, aux conditions des articles 42, 50 ou 90 du REIMR. Ces conditions incluent notamment que les concentrations de composés organiques volatils soient égales ou inférieures aux critères B.
3. Traités sur place ou dans un lieu de traitement autorisé.
4. Éliminés dans un lieu d'enfouissement visé par le RESC.

< annexe I du RESC

1. Utilisés pour remplir des dépressions naturelles ou des excavations sur le terrain d'origine lors de travaux de réhabilitation aux conditions prévues dans le plan de réhabilitation approuvé dans le cadre d'une analyse de risques (dossiers GTE), à la condition que les C₁₀-C₅₀ et les COV respectent les critères d'usage.
2. Traités sur place ou dans un lieu de traitement autorisé.
3. Éliminés dans un lieu d'enfouissement visé par le RESC.

≥ annexe I du RESC

1. Décontaminés sur place ou dans un lieu de traitement autorisé et gestion selon le résultat obtenu. Si cela est impossible, éliminés dans un lieu d'enfouissement visé par le RESC pour les exceptions mentionnées à l'article 4.1° a, b ou c.

Cas particuliers

1. Des sols contaminés peuvent être utilisés, à condition de ne dégager aucune odeur d'hydrocarbures perceptible, pour la construction d'un écran visuel ou antibruit dont l'utilité est démontrée :
 - a. Sur un terrain résidentiel avec des sols du terrain d'origine :
 - i. dont les concentrations sont ≤ B;
 - ii. dont les concentrations sont ≤ C, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols contiennent des concentrations ≤ B en C₁₀-C₅₀ et en composés organiques volatils (COV)⁴;
 - iii. dont les concentrations sont < annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols en place soient de niveau > C et que les sols déposés contiennent des concentrations ≤ B en C₁₀-C₅₀ et en COV⁴;

b. Sur un terrain commercial/industriel avec des sols du terrain d'origine :

- i. dont les concentrations sont $\leq C$;
 - ii. dont les concentrations sont $\leq C$, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement;
 - iii. dont les concentrations sont $<$ annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols en place soient $> C$, et que les sols déposés contiennent des concentrations $\leq C$ en C_{10} - C_{50} et en COV⁴.
2. La valorisation de sols contaminés dans un procédé en remplacement d'une matière vierge est possible aux conditions de l'autorisation.
 3. Les sols $\geq B$ peuvent être acheminés sur les aires de résidus miniers, s'ils sont contaminés exclusivement par des métaux ou métalloïdes résultant des activités minières de l'entreprise responsable de l'aire, aux conditions de l'autorisation délivrée par le Ministère (article 6 du RSCTSC).
 4. Les sols $\geq B$ peuvent être acheminés dans un lieu de dépôt définitif de matières dangereuses aux conditions du certificat d'autorisation détenu par ce lieu pour recevoir des sols.

Note : S'il y a présence de matières résiduelles dans les sols, se référer à la figure 12 de la section 7.7.2.

1. S'il est établi que la concentration naturelle dans le sol importé est supérieure au critère A et à la concentration du sol récepteur, il est recommandé au propriétaire du terrain récepteur de garder une trace du remblayage (localisation, niveau de contamination, provenance des sols importés), de façon à ce qu'il puisse, le cas échéant, démontrer qu'il ne s'agit pas d'une contamination anthropique. Faute de l'existence d'une telle trace, le Ministère considérera que les sols ont été contaminés par l'activité humaine et ils devront donc être gérés comme tels. Advenant le cas où les concentrations naturelles excèdent largement les critères génériques recommandés pour l'usage qui est fait du terrain récepteur, un avis sur les possibles risques à la santé et l'à-propos du remblayage avec de tels sols pourra être demandé à la direction de santé publique.
2. Ne s'applique pas aux sols contaminés $= B$, à moins que ces sols n'aient d'abord transité par un lieu visé à l'article 6 du Règlement sur le stockage et les centres de transfert de sols contaminés. Les sols excavés $\geq B$ ne peuvent en effet être acheminés directement que dans des lieux légalement autorisés à les recevoir et listés à l'article 6 du RSCTSC.
3. Il faudra toutefois s'assurer que la valorisation de sols A-B, auxquels on aura ajouté des matières fertilisantes ou non, entraîne un effet bénéfique, par exemple, sur la croissance de la végétation, et que ces sols répondent à un besoin réel, l'ajout de sols n'étant pas essentiel dans tous les cas de restauration minière. Il sera possible de s'assurer du bien-fondé du projet de valorisation et de son contrôle dans le cadre du certificat d'autorisation délivré préalablement à sa réalisation.
4. L'écran visuel ou antibruit doit être recouvert de 1 m de sols $\leq A$ ou de 40 cm $\leq A$ aux endroits recouverts d'une structure permanente (asphalte ou béton). Il est possible d'utiliser des MRF dans la couche apte à la végétation selon les orientations du *Guide sur l'utilisation des matières résiduelles fertilisantes pour la restauration de la couverture végétale des lieux dégradés* si la résultante est $\leq A$.

Appendix A STATEMENT OF GENERAL CONDITIONS

Appendix B DRAWING

Appendix C BOREHOLES RECORDS

Appendix D GEOTECHNICAL LABORATORY RESULTS

Appendix E CHEMICAL ANALYSIS RESULTS

**Appendix F GRID FOR EXCAVATED SOIL – APPENDIX 5 OF
MDDELCC INTERVENTION GUIDE**